Coastal Protection and Restoration Authority of Louisiana (CPRA)

2020 Operations, Maintenance and Monitoring Report

for

Oaks/Avery Canals Hydrologic Restoration

State Project Number T/V-13a
Priority Project List 6

August 2020
Iberia/Vermilion Parishes

Prepared by:

Maggie Luent
and
Dion Broussard
Coastal Protection and Restoration Authority of Louisiana
Lafayette Regional Office
Abdalla Hall, Room 201
635 Cajundome Boulevard
Lafayette, LA 70506

Suggested Citation:

Luent, M. and D. Broussard 2020. *2020 Operations, Maintenance, and Monitoring Report for Oaks/Avery Canals Hydrologic Restoration (TV-13a), Coastal Protection and Restoration Authority of Louisiana, Office of Coastal Protection and Restoration, Lafayette, Louisiana. 68 pp.*

2020 Operations, Maintenance, and Monitoring Report
For
Oaks/Avery Canals Hydrologic Restoration (TV-13a)

Table of Contents

Preface

This report includes monitoring data collected through September 2018, and annual Maintenance Inspections through June 2014. Additionally, damage assessments were performed following the recent impacts of Hurricanes Laura and Delta. The Oaks/Avery Canals Hydrologic Restoration (TV-13a) project is federally sponsored by the Natural Resources Conservation Service (NRCS) and locally sponsored by the Coastal Protection and Restoration Authority of Louisiana (CPRA) under the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA, Public Law 101-646, Title III). TV-13a is listed on the 6th CWPPRA Priority Project List (PPL-6).

The 2020 report is the 4th and final report in a series of reports. For additional information on lessons learned, recommendations and project effectiveness please refer to previous OM&M reports (2008, 2011 and 2016) as well as annual O&M inspection reports (2005-2014) on the CPRA website: http://cims.coastal.la.gov/.

I. Introduction

The Oaks/Avery Canals Hydrologic Restoration project area encompasses 2,876 acres (1,164 ha) located in the southeastern portion of Vermilion Parish and southwestern portion of Iberia Parish, north of Vermilion Bay (Figure 1). The Vermilion Bay shoreline makes up most of the southern boundary of the project area. The major tributaries and waterways within the project area are Oaks Canal to the west, Avery Canal on the east, and the Gulf Intracoastal Waterway (GIWW) traversing the project area east to west. Union Oil Canal makes up the eastern boundary of the hydrologic unit of the project north of the GIWW. Most soils in this area are classified as Lafitte Muck, which are very poorly drained, very fluid, organic soils in brackish marshes. In 1998 the area was composed of approximately 1,936 acres (783 ha) of brackish marsh and 791 acres (320 ha) of open water, 4.8% of which was dominated by submerged aquatic vegetation (SAV), with the remainder made up of non-marsh habitats (Natural Resources Conservation Service 1998). The dominant SAV species was *Myriophyllum spicatum* (Eurasian watermilfoil). The vegetation in the area has historically been classified as brackish and intermediate marsh (O'Neil 1949, Chabreck and Linscombe 1968, 1978, 1988). Land loss rates in the project area averaged -8 acres/yr from 1956-1978. Pre-project erosion rate estimates for the Vermilion Bay shoreline and the GIWW bank in the project area were -13 ft/yr (4 m/yr) and -5 to -10 ft/yr (1.5-3 m/yr) respectively.

This project consists of the following unrelated restoration components designed to address different land loss problems within the project area: protection of Vermilion Bay shoreline with vegetative plantings; protection of GIWW bankline with rock dikes; stabilization of water level variability north of the GIWW and east of Oaks Canal by installation of a steel sheetpile weir in the "Cowpath" canal, a rock plug in a large breach in the north bank of an oilfield canal, spoilbank restoration along sections of the western bank of Union Oil Canal, and bank paving of the east and west banks of Oaks Canal at its convergence with Vermilion Bay. Approximately 1,200 ft of bankline protection was installed on the south bank of the GIWW adjacent to the area where Bayou Petite Anse exits Tigre Lagoon and enters Vermilion Bay. The remaining 6,300 ft of bankline stabilization was installed on the north bank of the GIWW immediately west of Oaks Canal.

During the life of the 20 year project, 160 acres (65 ha) of wetlands are projected to be protected. Approximately 34,000 *Spartina alterniflora* (smooth cordgrass) plants were planted along 5.1 miles of the Vermilion Bay shoreline in the summer of 2000. Project construction of structural components began on June 25, 2002 with the construction of approximately 7500 linear feet of rock dikes to protect the shoreline of the GIWW by contractor Luhr Brothers, Inc. of Columbia, Illinois. Subcontractors Bertucci Construction Company of Jefferson, Louisiana and Berry Brothers General Contractors, Inc. of Berwick, Louisiana completed project construction with the installation of a low sill sheetpile structure, low sill rock weir, spoilbank refurbishment, and navigation aids. Construction of the $2.8 million project was completed on October 14, 2002.

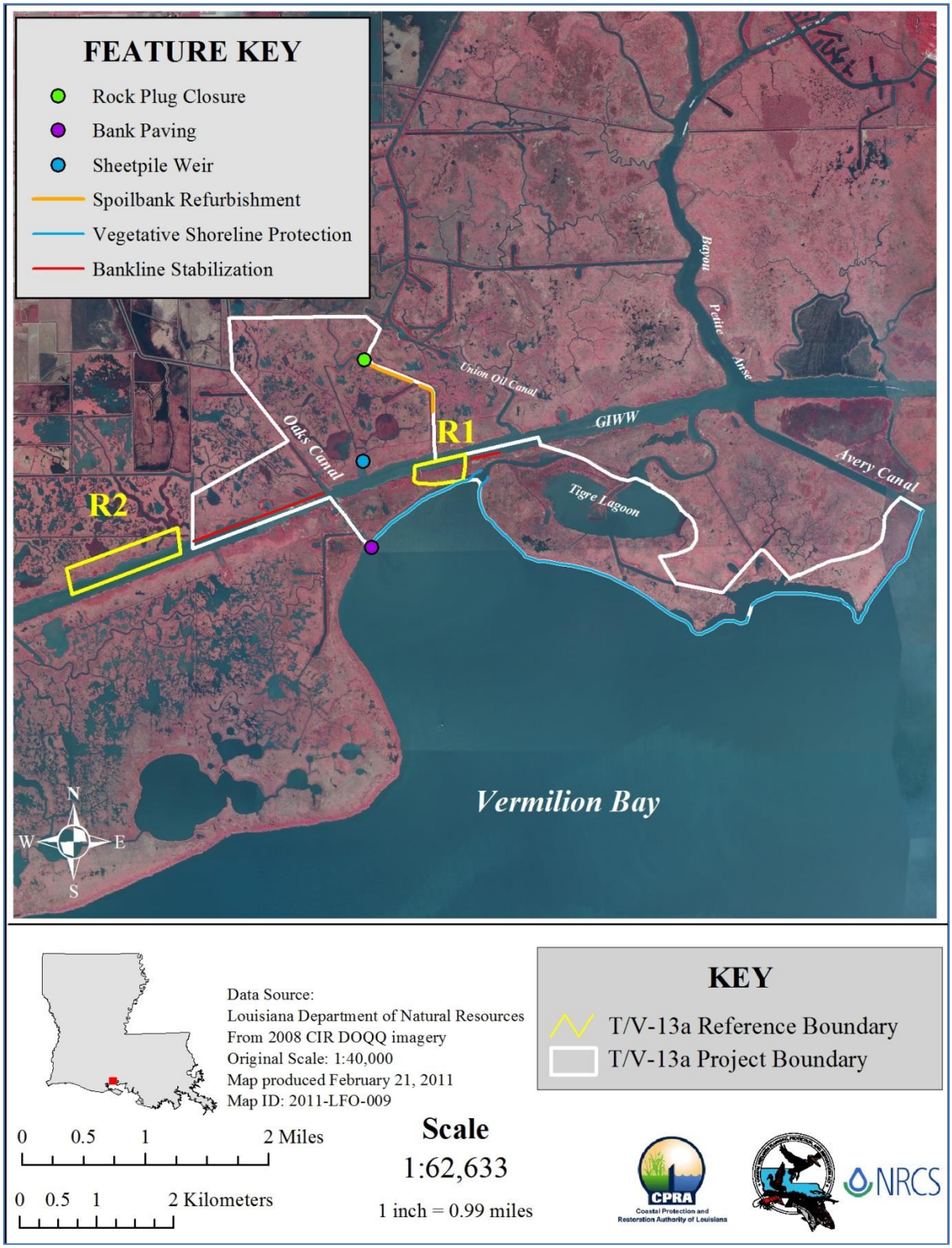


Figure 1. Locations of the TV-13a project and reference areas and project features.

II. Maintenance Activity

a. Project Feature Inspection Procedures

The purpose of the annual inspection of the Oaks/Avery Canals Hydrologic Restoration Project (TV-13a) is to evaluate the constructed project features to identify any deficiencies and prepare a report detailing the condition of project features and recommended corrective actions needed. Should it be determined that corrective actions are needed, CPRA shall provide, in the report, a detailed cost estimate for engineering, design, supervision, inspection, and construction contingencies, and an assessment of the urgency of such repairs. The annual inspection report also contains a summary of maintenance projects which were completed since completion of constructed project features and an estimated projected budget for the upcoming three (3) years for operation, maintenance and rehabilitation. The three (3) year projected operation and maintenance budget is shown in Appendix B. A summary of past operation and maintenance projects completed since completion of the Oaks/Avery Canals Project are outlined in Section II.d.

Inspections of the Oaks/Avery Canals Hydrologic Restoration Project (TV-13a) were held following Hurricane Laura on September 11, 2020 and following Hurricane Delta on October 14, 2020. In attendance were Dion Broussard, Stan Aucoin, and Maggie Luent of CPRA. Representatives of NRCS were unable to attend. The inspections began at the rock dike at the East end of the South bank of the GIWW shoreline protection and moved westward.

The field inspection included a complete visual inspection of the entire project site. Staff gauge readings, when available, and existing temporary benchmarks were used to determine approximate elevations of water, rock dikes, earthen embankments, low sill sheet pile weir and other project features. Photographs were taken at each project feature (see Appendix A) and Field Inspection notes were completed in the field to record measurements and deficiencies (see Appendix C).

b. Inspection Results

Site 1—Rock dike/North bank

The dike is in excellent condition. The rock settlement at the old oilfield location at N 29° 49’ 58.3” and W 91° 59’ 25.9” has been lifted back to grade through a maintenance event completed in October 2019. The eastern rock tie-in, which was previously noted to be experiencing some minor erosion is now stable. The western tie-in remains stable, as well. (Appendix A; Photo 1)

Site 2—Rock paving at Oaks Canal

The rock revetment along both sides of Oaks Canal at the mouth of Vermilion Bay remains in good condition. The small bank between Bayou Hebert and the bay has eroded in a 50-foot section. This portion of bank was previously restored by the Vermilion Parish Gravity Drainage

District in 2014 via dredging and spoil placement on the eroded bank area. This portion of bank is now protected by the construction of a rock dike, which extends 200 ft to the west from the existing rock revetment at the mouth of the Oaks Canal. This maintenance was completed in October 2019. (Appendix A; Photos 2-4)

Site 3—Cow path Structure

The landowner notified CPRA on April 23, 2018 that the Cow Path weir had failed. CPRA and NRCS made a site visit to inspect the damage on June 13, 2018. The eastern portion of the sheet pile weir was still standing and the western portion was no longer embedded. There appeared to be no change to the condition of the structure at the time of the post storm damage assessments. (Appendix A; Photo 5)

Site 4—Spoilbank Maintenance (Union Canal)

Spoilbank maintenance done in a previous maintenance event looks good and is in the same condition as the last inspection.

Site 5—Rock plug

The rock plug located on the north section of the project area near Union Canal has been gapped during a 2012 maintenance event. This rock plug is no longer accessible and will not be inspected. (Appendix A; Photo 6)

Site 6—Rock dike/South bank

The rock dike is similar to immediate post construction condition and in no need of any repairs. (Appendix A; Photo 7)

Site 7—Vegetation plantings

The shoreline plantings were not directly inspected on this trip due to time and wave constraints. The vegetation near the mouth of Oaks Canal is in fair condition and it is expected that this condition was typical along the remainder of the bay shore.

Site 8 – Spoilbank Maintenance (Oaks Canal)

The spoilbank maintenance is in good condition and has fully vegetated. (Appendix A; Photo 8)

Site 9 – Earthen Canal Plug (Union Canal)

The Earthen Canal plug has experienced some settlement in a 50’ section and is approximately at a +2.5’ elevation where the settlement occurred. No further settlement has occurred and the vegetation is flourishing. (Appendix A; Photo 9-10)

c. Maintenance Recommendations

i. Immediate/ Emergency Repairs

None

ii. Programmatic/ Routine Repairs

The Cow Path weir needs to be repaired to get the project back to good working order. CPRA and NRCS have requested more funding to remove the Cow Path weir and replace it with a low sill rock weir.

d. Maintenance History

General Maintenance: Below is a summary of completed maintenance projects and operation tasks performed since October 2002, the construction completion date of the Oaks/Avery Canals Hydrologic Restoration Project.

2007 Acadian Engineers – Post construction surveys were conducted to establish inlet/outlet baseline channel conditions adjacent to the Cowpath weir. These were performed by Acadian Engineers at a cost of $5,194.15.

2012 Southern Delta Construction – A breach occurred off of the eastern embankment of Oaks Canal which was circumventing the hydrologic boundary of the project, additionally there were some low spots along the same embankment south of the breach. The project included:

1. Approximately 800 feet (including the creation of an earthen canal plug) of levee was refurbished and raised to a grade of approximately +5 ft along the Oaks Canal.
2. An earthen canal plug was constructed on the Union Canal approximately 200 ft in length across the channel. The intended elevation was to be +5 ft across the entire plug. Due to continuous problems with base failure and poor borrow material, approximately 50 ft section of the plug has settled to approximately +3 ft elevation. The rest of the plug is at or near the intended +5 ft elevation.
3. The existing rock plug was gapped to allow for fisheries movement.
4. A navigation aid was installed at the newly constructed earthen canal plug on the Union Canal.

Construction----------	$153,413.75
E&D, Construction Oversight, As-Builts ----------	$15,000.00
Total Project Cost	**$168,413.75**

2019 Southern Delta Construction – A rock maintenance event to cap a small subsided section of the northern rock dike on the GIWW. Also, the rock at the mouth of the Oaks Canal was extended to the west.

1. 1387 tons of rock rip rap was placed at the mouth of the Oaks Canal to extend the armament 200 feet to the west along the shoreline.

2. 294 tons of rock rip rap was placed along a 200-foot section of subsided rock dike on the northern rock dike on the GIWW.

Construction----------	$181,214.50
E&D, Construction Oversight, As-Builts ----------	$98,027.00
Total Project Cost	**$279,241.50**

Structure Operations: There are no active operations associated with this project.

III. Operation Activity

a. Operation Plan

There are no water control structures with operational features associated with this project; therefore, no Structural Operation Plan is required.

b. Actual Operations

There are no water control structures with operational features associated with this project, therefore no required structural operations.

IV. Monitoring Activity

a. Monitoring Goals

The objectives of the Oaks/Avery Hydrologic Restoration Project are:
1. Protect the Vermilion Bay shoreline through the planting of *S. alterniflora*.
2. Protect sections of the GIWW bank from erosion through use of rock dikes.
3. Stabilize water levels in the hydrologic unit.

The following goals will contribute to the evaluation of the above objectives:
1. Reduce erosion rate on the northern shoreline of Vermilion Bay.
2. Reduce erosion rate of specific high-risk portions of the GIWW bank.

3. Attenuate rapid water level fluctuations in hydrologic unit.
4. Reduce rate of loss of emergent vegetated marsh area in the hydrologic unit.

b. Monitoring Elements

Aerial Photography:

Near-vertical color-infrared aerial photography (1:12,000 scale) was used to measure vegetated and non-vegetated areas for the project and reference areas. The photography was obtained in 2000 (pre-construction), 2002, 2006 (post-construction) and for a final time in 2014. The original photography was checked for flight accuracy, color correctness, and clarity and was subsequently archived. Aerial photography was scanned, mosaicked, and georectified by USGS/NWRC personnel according to standard operating procedures (Steyer et al. 1995, revised 2000).

Shoreline Change:

The shoreline position was monitored along Vermilion Bay, along sections of the GIWW bank where rock dikes were constructed, and along the reference area bankline in R1 and R2. A differentially corrected Global Positioning System (dGPS) was used to map the Vermilion Bay shoreline in 2000 (immediately following planting of vegetation), 2003, 2007, 2010 and 2015. A final shoreline position was surveyed in 2018. The bankline along the GIWW in the project and reference areas was mapped in 2003 immediately following construction of the rock dike, in 2006, 2014 and a final mapping in 2018. The difference between bankline change in the reference areas and the project will be used to estimate the area of wetlands protected by the rock dikes along the GIWW. Because of the lack of a suitable reference area for the Vermilion Bay shoreline, the benefits of the plantings will be inferred from the survival of the plantings and temporal changes in shoreline position, from which changes in rate of loss can be calculated.

Water Level:

Salinity and water level data were collected in 1999 and 2003 at four recorder stations (Figure 2) to monitor hydrologic conditions (water depth, salinity) and document water levels within the hydrologic unit. One data recorder was placed inside the unit and three recorders were placed outside the project area at three locations along a semi-natural waterway at increasing distances from the GIWW (Figure 2). Water level data were used to document the water level variability in the project area relative to the reference data recorders. Water level data were collected at the shortest interval possible with the recorders (every 30 seconds) for 10 days each month during a 6-month period for the year 1999 (pre-construction) and year 2003 (post-construction). Specifically, water level data have been collected at the above-mentioned stations from 02/05/1999 – 09/02/1999 and 02/24/2003 – 09/06/2003. Even though CRMS0532 is located within the project boundary it was not used to monitor water level because it is not directly affected by the hydrologic management.

Vegetative Shoreline Protection:

The general condition of *S. alterniflora* plantings along Vermilion Bay (installed in the summer of 2000) was documented in July 2001 by monitoring twenty 40-ft long vegetation sampling plots (3% of entire planted area) (Figure 3). Each plot consisted of 16 plantings with the sampling location determined by a random numbers table based on distance and marked with a pole. Species composition and percentage cover for the 16-plant plot was documented using the Braun-Blanquet procedure. Survival was determined as a percentage of the number of live plants to the number planted (within the plot) (Mendelssohn et al. 1991).

CRMS-*Wetlands* (CRMS) Supplemental

In addition to project specific monitoring elements, other data types are collected at CRMS sites which can be used as supporting or contextual information (Figure 4). Data types collected at CRMS sites include hydrologic from continuous recorder, vegetative, physical soil characteristics, discrete pore water, surface elevation, and land:water analysis of 1 km^2 area encompassing the station. For this report, soil properties, vegetation, elevation change, land change and hydrologic data from one site within the project area (CRMS0532) and two sites outside the project area (CRMS0527 and CRMS0531) are presented. Data collected from the CRMS network over a sufficient amount of time to develop valid trends is being used to develop integrated data indices (hydrology, plant productivity, and soil surface elevation change) at different spatial scales (local, basin, coastal) to which we can compare project performance.

Soil cores were collected one time to describe soil properties (bulk density and percent organic matter). Three, 4" (10.16-cm) diameter cores were collected to a depth of 24 cm and divided into 6, 4-cm sections at each site. The Department of Agronomy and Environmental Management at Louisiana State University processed the soil. Cores were collected at the site inside the project area, and suitable cores (quality or same marsh type) were collected from one site (CRMS0527) outside the project area.

Emergent vegetation parameters are evaluated at each CRMS site using techniques described in Steyer et al (1995) to describe species composition, richness, and relative abundance; in addition, overall percent cover and height of the dominant species are monitored. Annually at each site, data are collected and averaged from ten, 4-m^2 sample plots randomly established along a 282.8 m transect that crosses diagonally through a 200-m × 200-m vegetation plot in middle of the CRMS site.

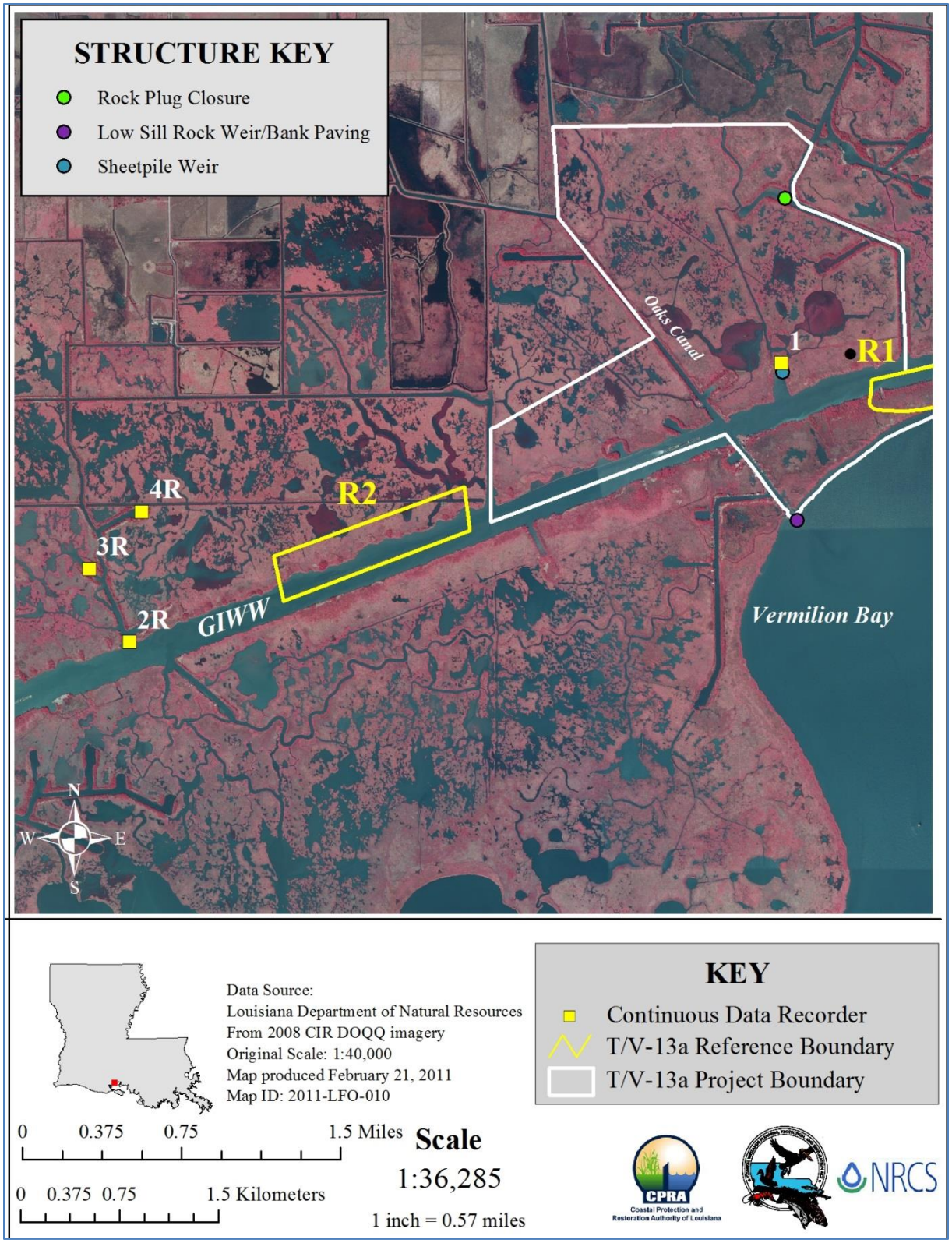


Figure 2. Locations of hydrographic monitoring stations in the TV-13a project and reference areas.

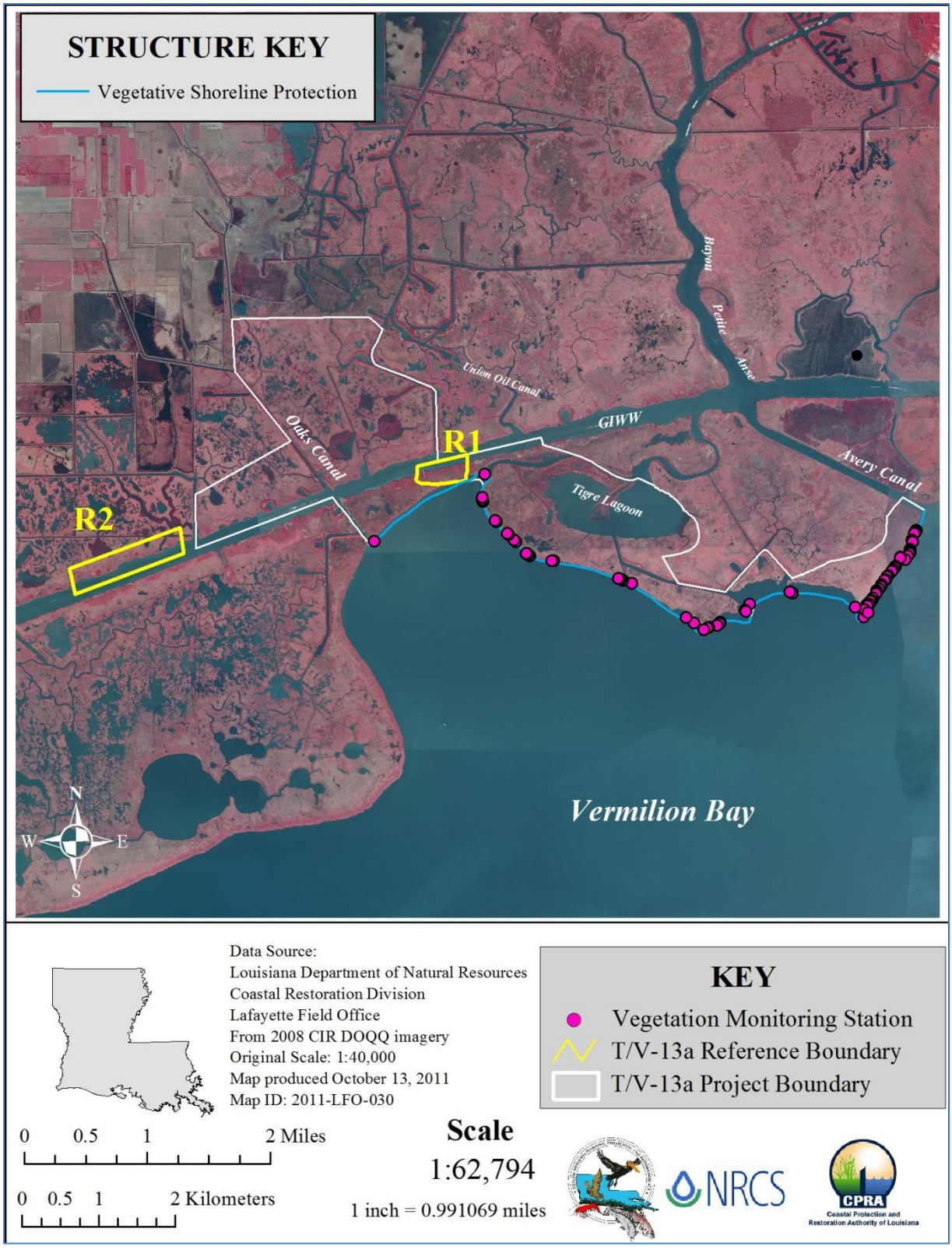


Figure 3. Locations of planted vegetative survey stations in the TV-13a project area.

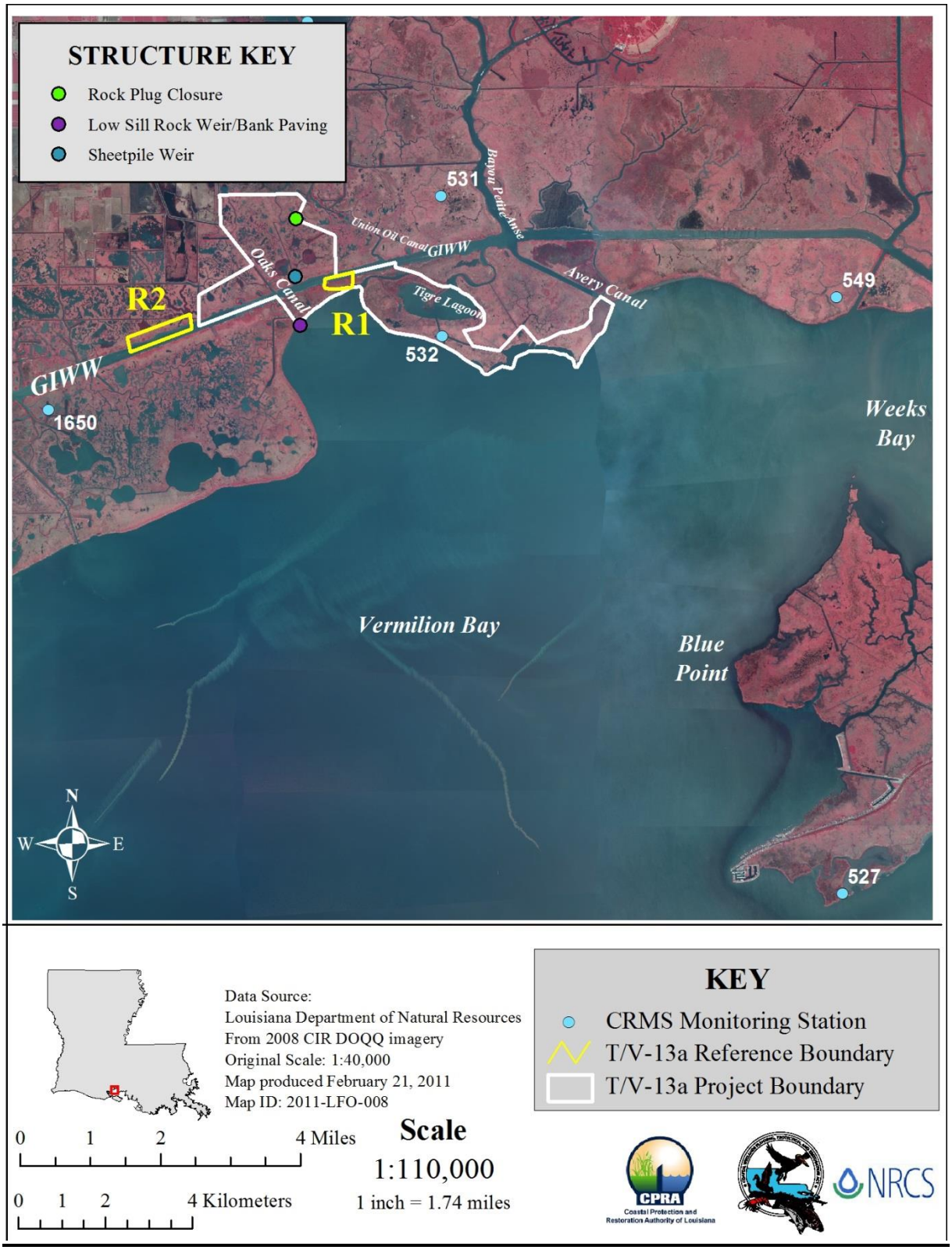


Figure 4. Location of CRMS monitoring sites within and near the TV-13a project area.

The percent cover of the plot and of each species is fed into a floristic quality index based on the marsh type the data was collected. Floristic Quality Indices (FQIs) have been developed for several regions to determine the quality of a wetland based on its species composition (Cohen et al., 2004; Bourbaghs et al., 2006). This FQI was developed by Jenneke Visser and an expert panel on Louisiana coastal vegetation as part of CRMS analytical working group in 2007 to develop integrated data indices (hydrology, plant productivity, and soil surface elevation change) at different spatial scales (local, basin, coastal) to which we can compare project performance. The panel provided an agreed upon score (Coefficient of Conservatism or CC Score) from 0 to 10 for each species in a list of ~500 plant species occurring in Louisiana's coastal wetlands. CC scores are weighted by percent vegetative cover and summed to determine the FQI for the CRMS site. CRMS sites inside and outside the project area were used for this report.

Continuous salinity data are collected hourly. Discrete pore-water from the soil salinity at 10 and 30 cm are collected at five of the vegetation plots during vegetation sampling. Pore water is extracted with a sipper tube assembly (rigid aquarium tubing, flexible hose, and syringe), and salinity is measured using a hand held salinity meter (YSI 30 Salinity, Conductivity, Temperature Meter).

CRMS0532 is located within the project area. This site is in the portion of the project area affected by the shoreline restoration, but is not affected by the hydrologic management aspect of the project. Reference stations locations were chosen based on tidally influenced marsh in the Acadiana Bays complex which differs from the rest of the coast because the marsh is protected by Marsh Island and not protected by weirs so to limit other hydrologic influences. CRMS0527 and CRMS0531 are utilized as reference sites for this report. CRMS0527 is similar to the project site, but without any shoreline protection measures. CRMS0531 is nearer to the project than CRMS0527. However, this site is farther inland and may not be experiencing the same conditions as the project area site. All three sites are in intermediate marsh.

c. Monitoring Results and Discussion

Aerial Photography:

Aerial photography collected pre-construction (2000 and 2002) show the project area percent land around 66% while reference area 1 and reference area 2 were around 63 and 54%, respectively. The project area percent land remained relatively unchanged post-construction (2002-2014), increasing slightly from 66% to 65%. Reference area 2 showed a similar trend, however slightly decreasing here from 54% to 50%. The largest change was seen at reference area 1 where percent land dropped significantly after 2002 from 63% to 38% in 2006. This is more than likely a result of Hurricane Rita in 2005. However, since 2006 aerial photography, reference area 1 has been on the mend with land area increasing from 38% to 59% in 2014.

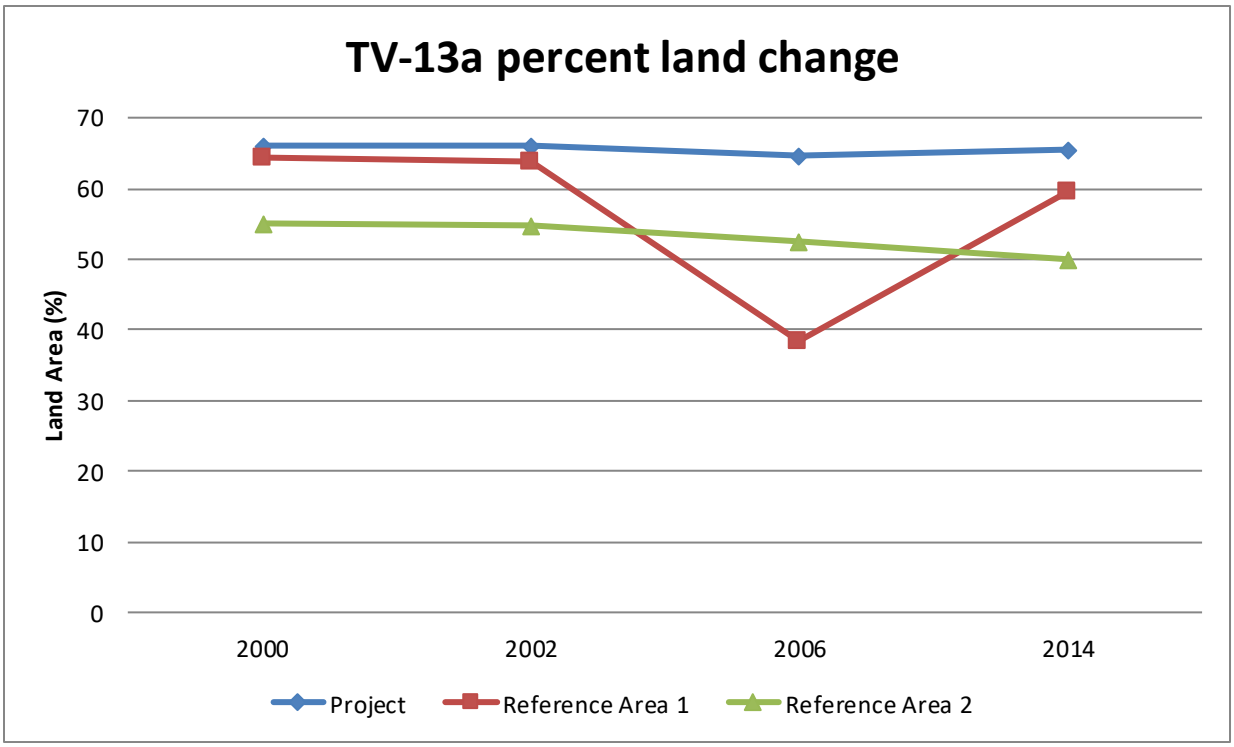


Figure 5. Percent land change over time comparing TV13-a project and reference areas.

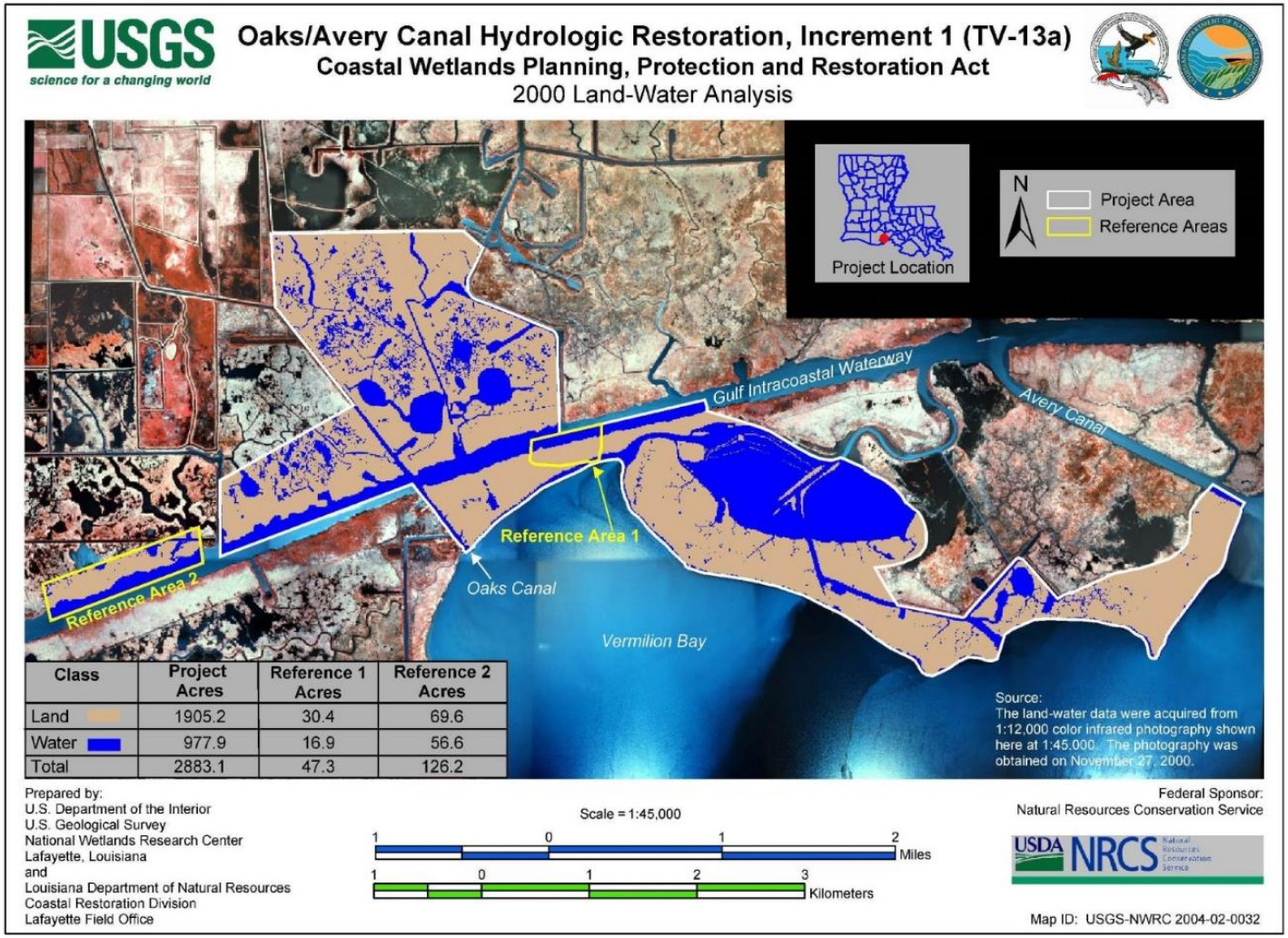


Figure 6. Results of the 2000 Land:Water GIS image classification for the TV-13a project and reference areas. This photography was taken after vegetative plantings but before rock installment..

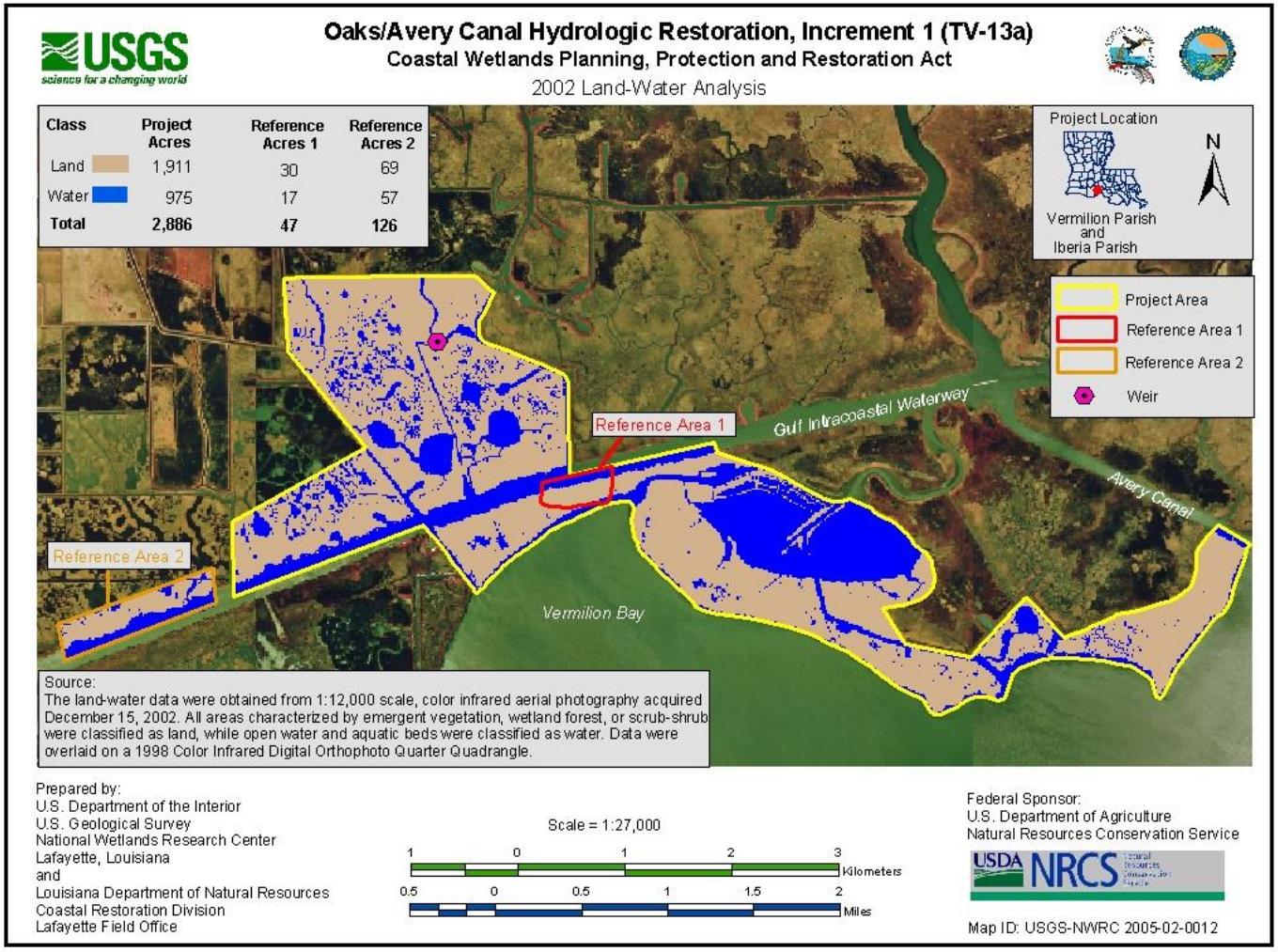


Figure 7. Results of the 2002 Land:Water GIS image classification for the TV-13a project and reference areas after rock installment.

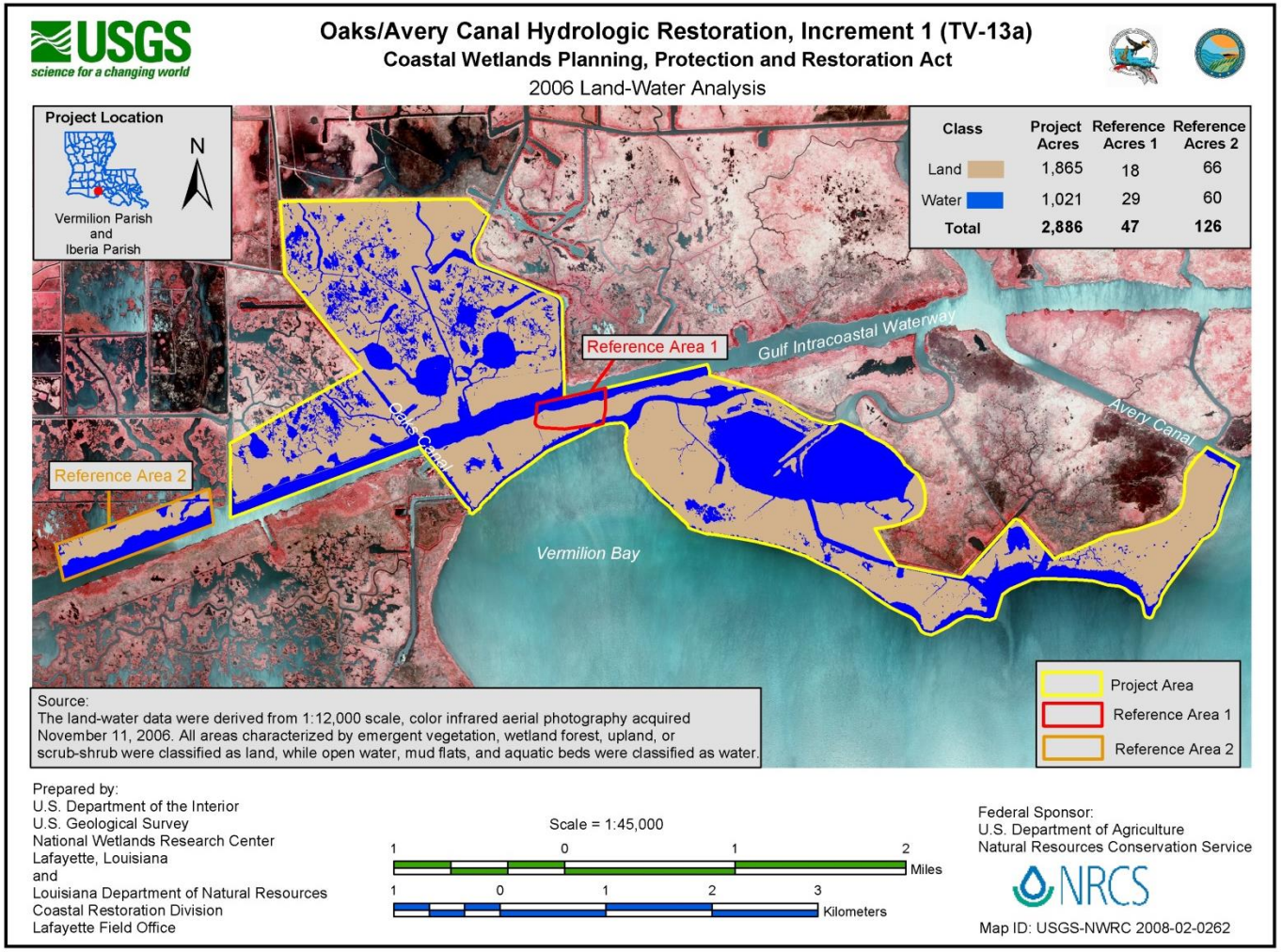


Figure 8. Results of the 2006 Land:Water GIS image classification for the TV-13a project and reference area.

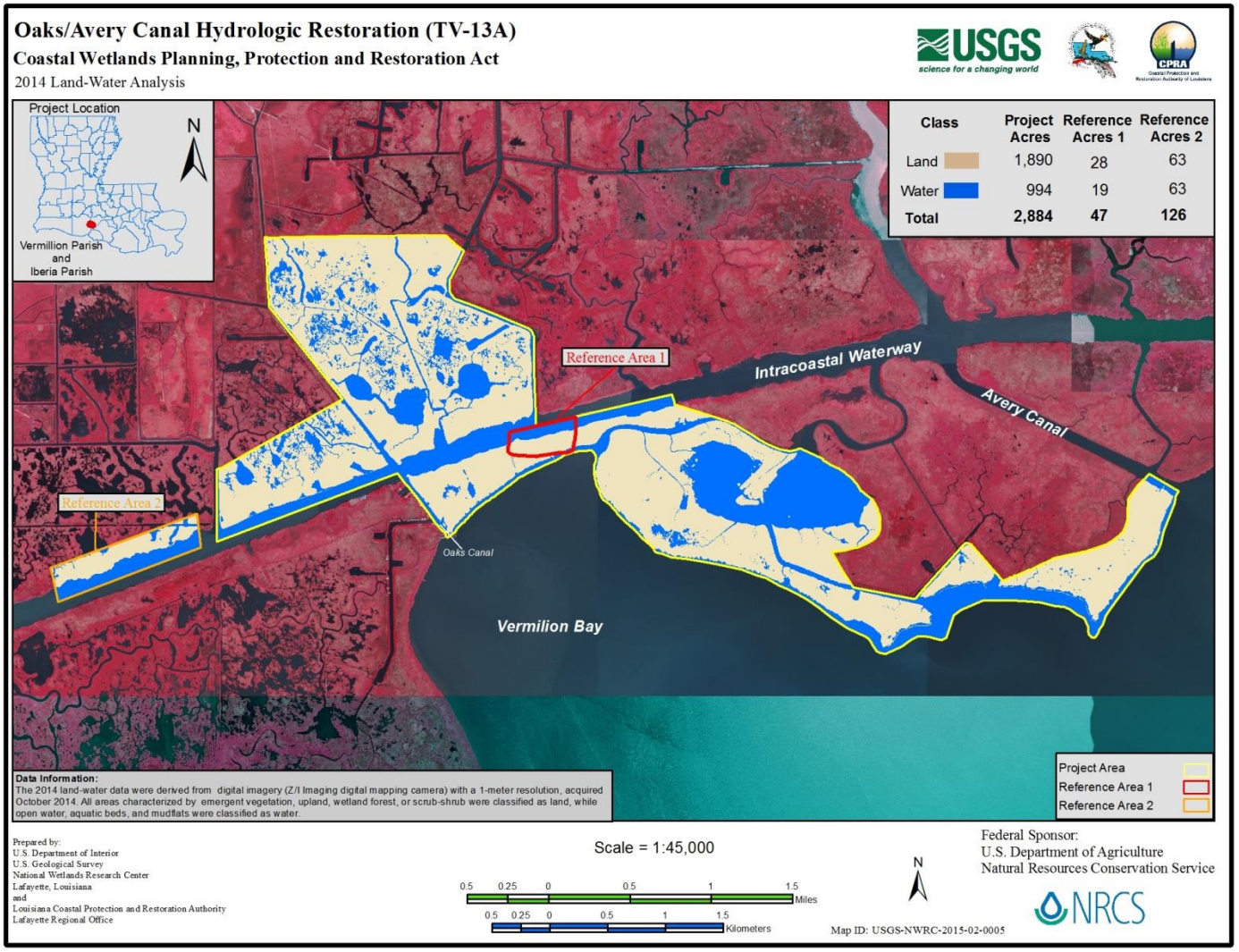


Figure 9. Results of the 2014 Land:Water GIS image classification for the TV-13a project and reference area.

Shoreline Change:

Shoreline protection along the GIWW prevented erosion and allowed for bank expansion. As-built (immediately post-construction) bankline positions for the project and reference areas along the GIWW were collected following rock dike construction in 2002 and again in 2006/7, 2010, 2015 and 2018 (Table 1). Since 2015, the project bankline prograded at a mean rate of 0.9 m/yr (2.9 ft/yr) and the unprotected reference area eroded at a rate of -1.2 m/yr (-3.9 ft/yr) (Figures 10 - 11). These data are consistent with shoreline change in other rock dike projects built along the GIWW. The rock dikes have been successful in capturing sediment which in turn has aided in reaching the monitoring goal of reducing erosion rates long the GIWW.

The Vermilion Bay shoreline continued to erode throughout the project area with the most erosion seen in periods that included hurricanes. Data were collected in 2000 (pre-construction), 2003 (post-planting), 2007, 2010, 2015 and 2018 for the Vermilion Bay shoreline (Table 1, Figures 10 and 12). Shoreline loss for the project area measured -3.6 m/yr (11.8 ft/yr) since 2015, higher than the last measurement of -1.2 m/yr (3.9 ft/yr). It is likely that erosion rates from 2003-2007 increased due to Hurricane Rita, which battered the shoreline of the project with high winds and a storm surge of as much as 11-12 ft. During the entire monitoring period (2000-2018), the shoreline retreated at a rate of -3.1 m/yr (-10.17 ft/yr, Figure 13). This is an increase of -0.4 m/yr for the overall project time period which was likely exacerbated by Hurricane Barry in July of 2019. Even though the *Spartina alterniflora* plantings were indistinguishable post-planting in 2001, sadly they did not proliferate and aid in protecting the Vermilion Bay shoreline from erosion.

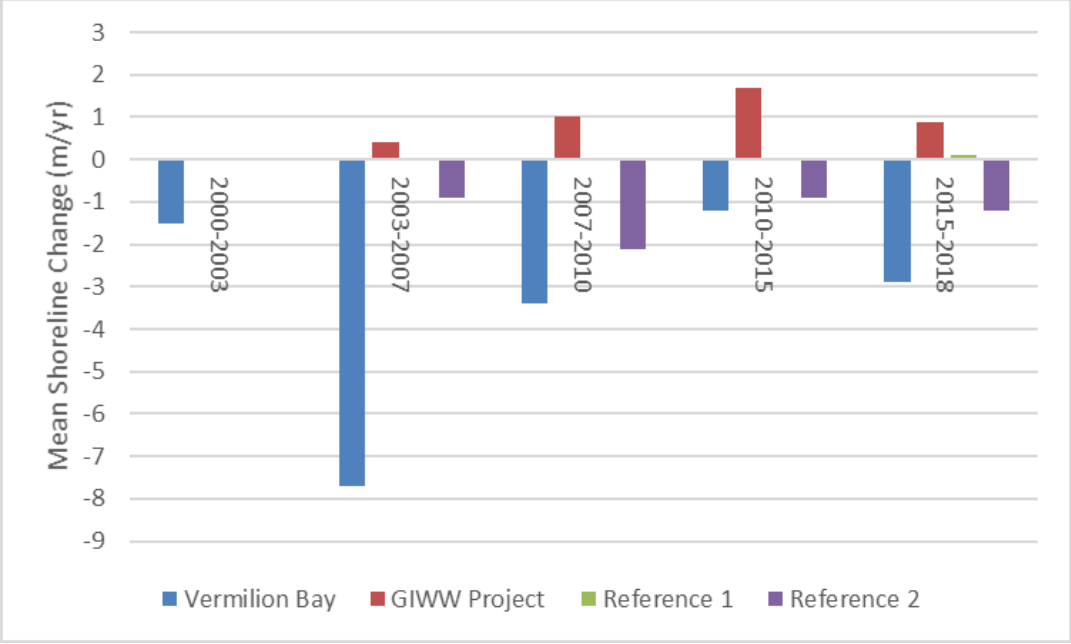
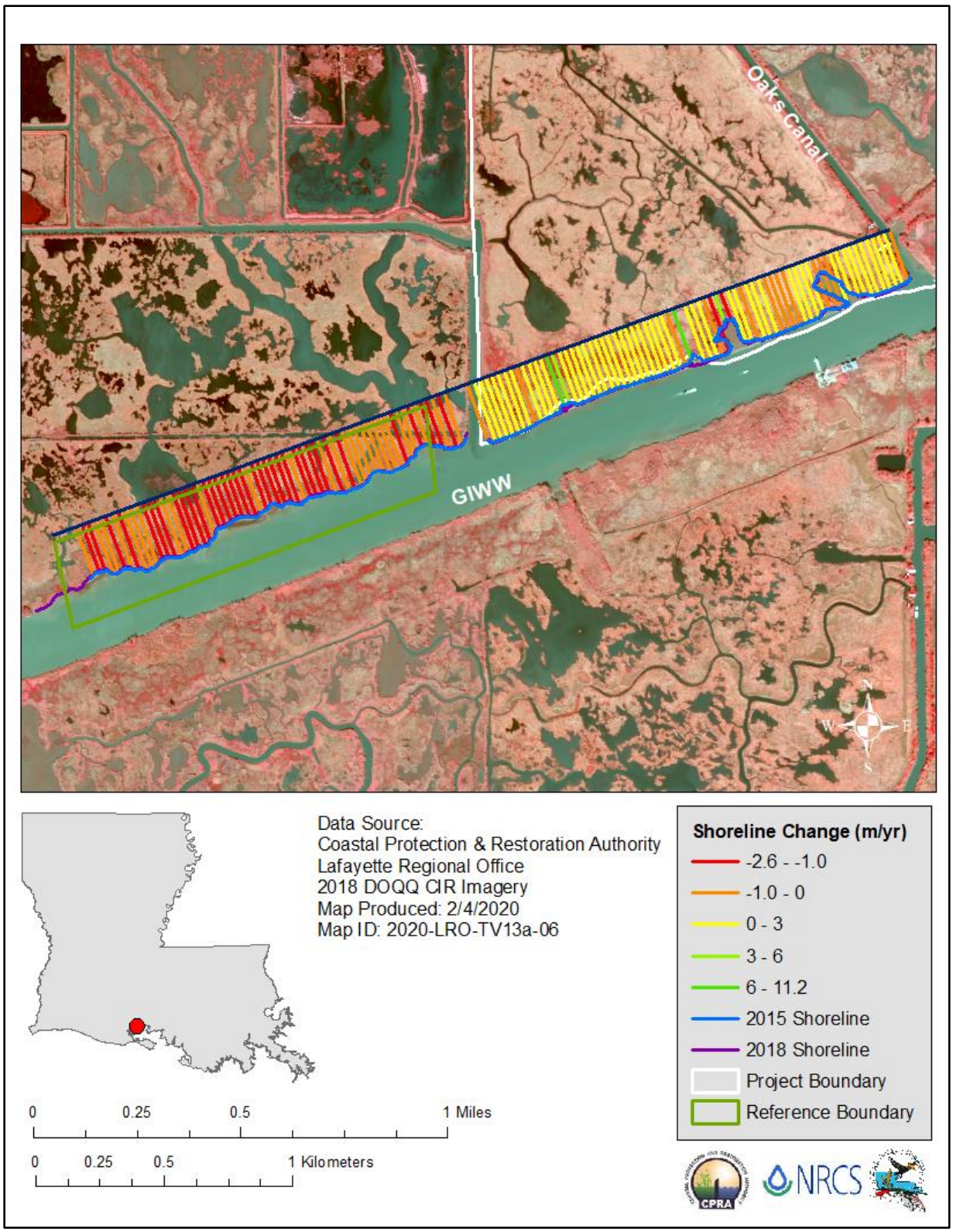


Figure 10. Shoreline change rates over time. Initial construction was completed in October 2002; Hurricane Lili occurred in October 2002, Hurricane Rita occurred in September 2005, Hurricane Ike occurred in September 2008 and Hurricane Barry occurred in July 2019.

Table 1. Shoreline change rates derived from dGPS surveys. Initial construction was completed in October 2002; Hurricane Lili occurred in October 2002, Hurricane Rita occurred in September 2005, Hurricane Ike occurred in September 2008 and Hurricane Barry occurred in July 2019.

	Shoreline Change Rate (m/yr)-Mean	SE +/-	Shoreline Change Rate (m/yr)-Max Loss	Shoreline Change Rate (m/yr)-Max Gain
Vermilion Bay				
2000-2003	-1.5	8.0	-30.7	7.2
2003-2007	-7.7	12.5	-35.3	2.4
2007-2010	-3.4	4.5	-28.5	1.7
2010-2015	-1.2	3.4	-18.5	3.7
2000-2015	-2.7	4.7	-19.8	5.3
2015-2018	-2.9	1.9	-12.7	0.7
2000-2018	-3.1	3.7	-16.7	1.94
GIWW Project				
2003-2006/7	0.4	1.5	-9.0	3.0
2006/7-2010	1.0	1.5	-1.7	9.2
2010-2015	1.7	2.4	-1.8	8.5
2015-2018	0.87	1.91	-1.08	11.21
GIWW Reference 1				
2015-2018	0.093	0.63	-2.11	1.63
GIWW Reference 2				
2003-2006/7	-0.9	0.5	-3.5	0.3
2006/7-2010	-2.1	1.0	-5.0	0.2
2010-2015	-0.9	0.5	-2.9	1.0
2015-2018	-1.21	0.66	-2.6	-0.02


Oaks Canal
GIWW
N
W
E
S
Data Source:
Coastal Protection & Restoration Authority
Lafayette Regional Office
2018 DOQQ CIR Imagery
Map Produced: 2/4/2020
Map ID: 2020-LRO-TV13a-06
0 0.25 0.5 1 Miles
0 0.25 0.5 1 Kilometers
Shoreline Change (m/yr)
-2.6 - -1.0
-1.0 - 0
0 - 3
3 - 6
6 - 11.2
2015 Shoreline
2018 Shoreline
Project Boundary
Reference Boundary
CPRA
NRCS

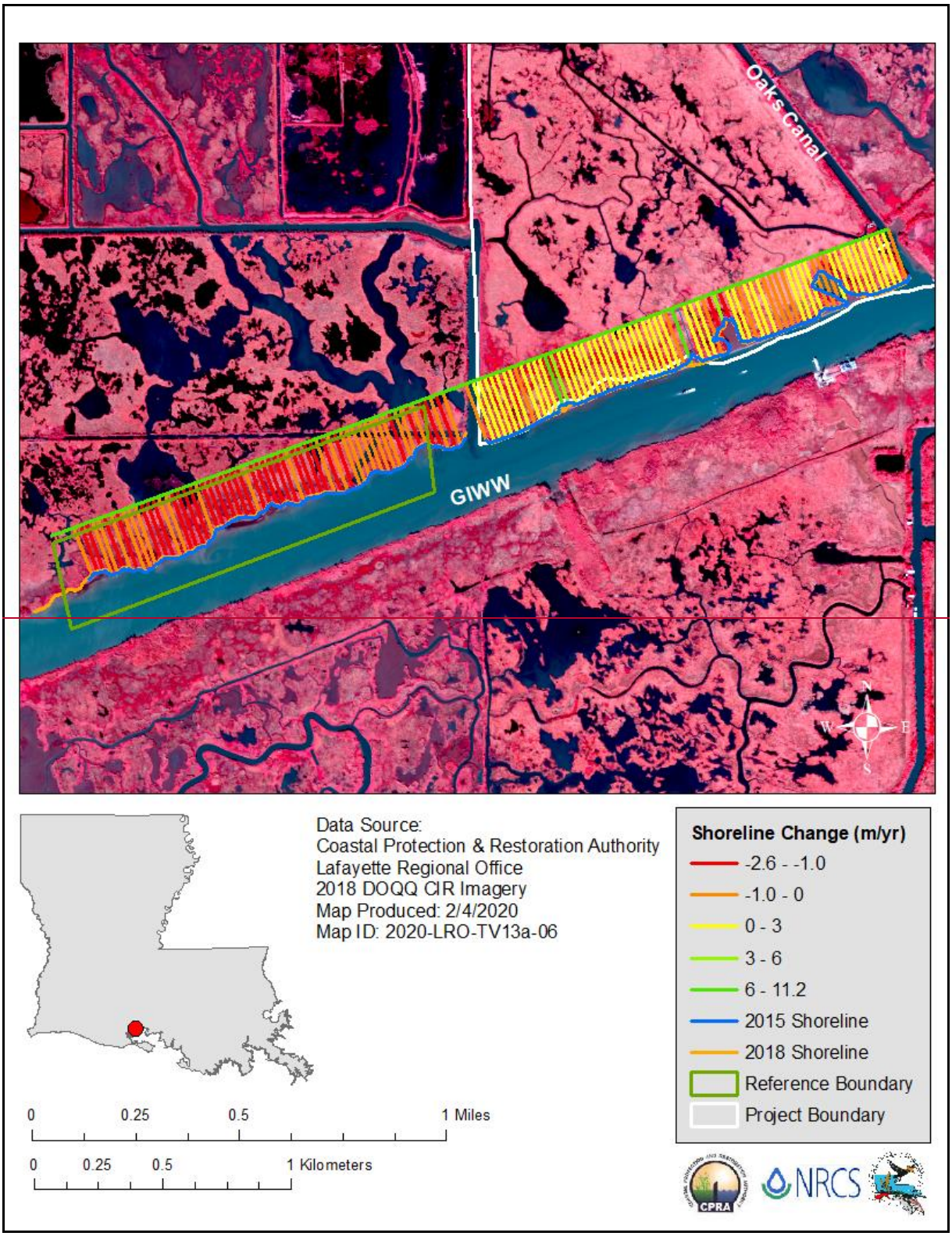
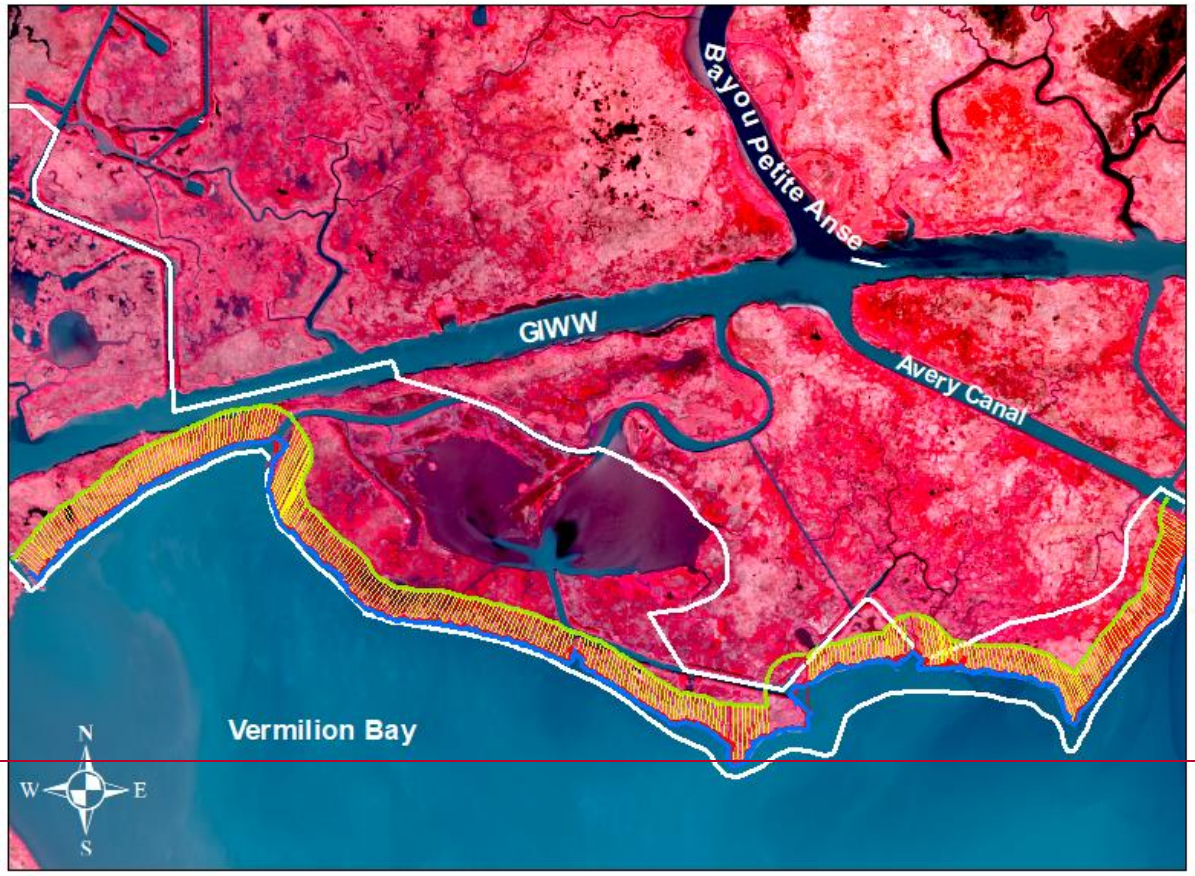


Figure 11. Shoreline change in the TV-13a project area along the GIWW for the period 2015-2018.



Data Source:
Coastal Protection & Restoration Authority
Lafayette Regional Office
2018 DOQQ CIR Imagery
Map Produced: 2/4/2020
Map ID: 2020-LRO-TV13a-08

0 0.5 1 2 Miles

0 0.5 1 2 Kilometers

Shoreline Change (m/yr)

- -69 - -25
- -25 - -10
- -10 - 0
- 0 - 5
- 5 - 11.36
- 2015 Shoreline
- 2018 Shoreline
- TV13a Project Boundary

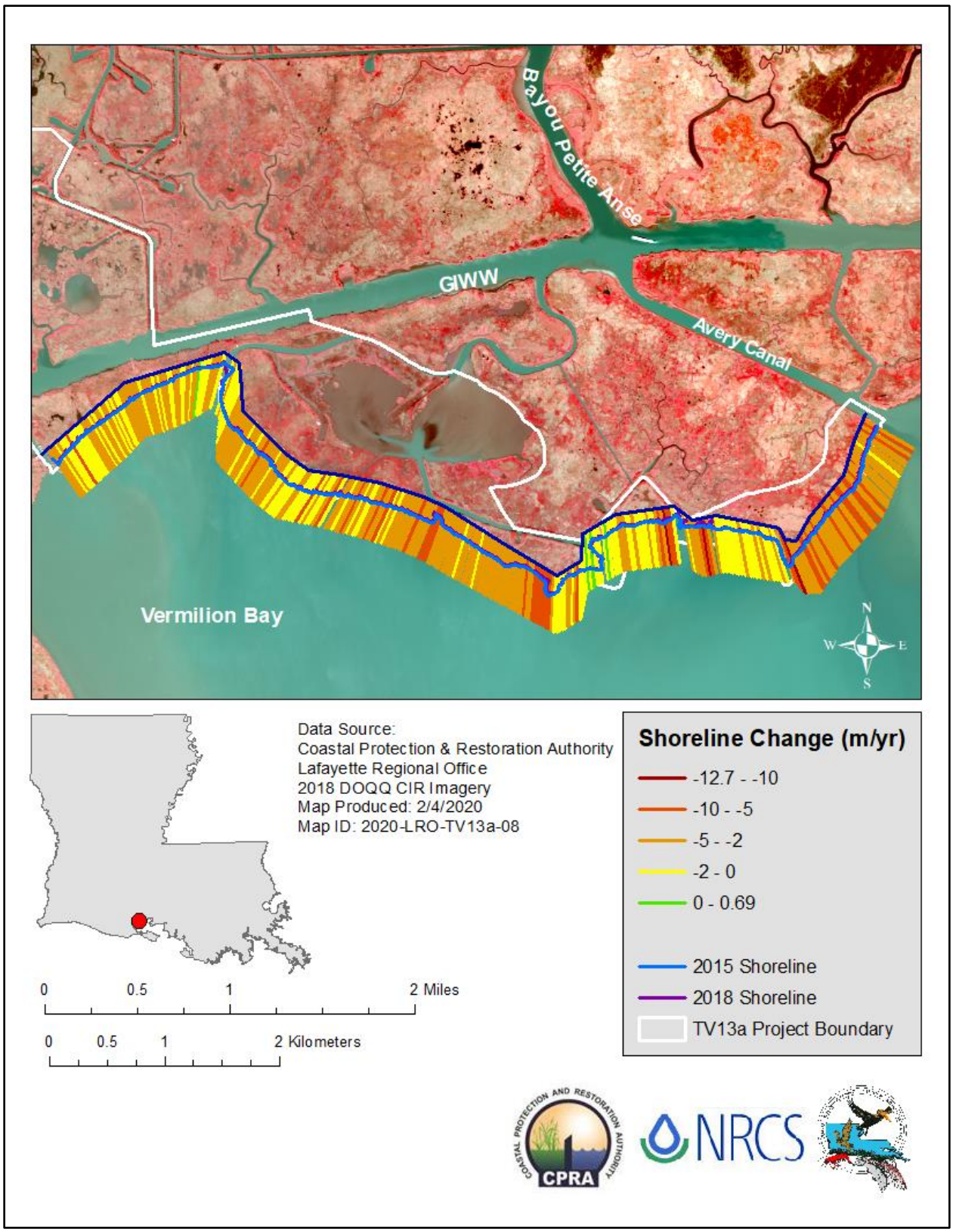
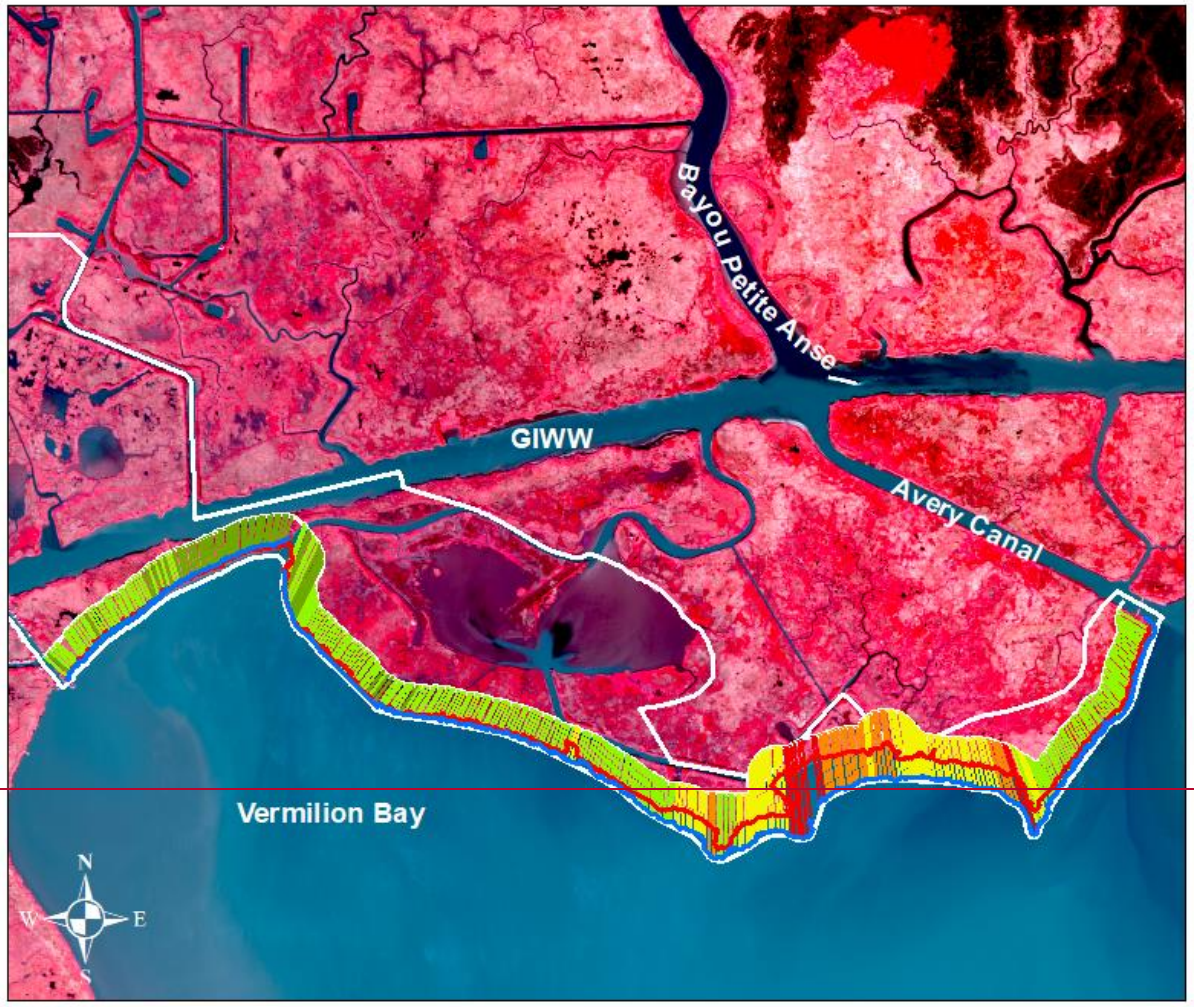
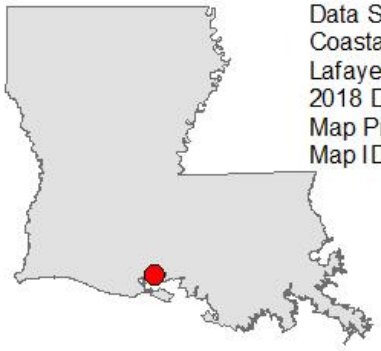


Figure 12. Shoreline change along the shore of Vermilion Bay during the period 2015-2018.





Data Source:
Coastal Protection & Restoration Authority
Lafayette Regional Office
2018 DOQQ CIR Imagery
Map Produced: 2/4/2020
Map ID: 2020-LRO-TV13a-07

0 0.375 0.75 1.5 Miles

0 0.375 0.75 1.5 Kilometers

Shoreline Change (m/yr)

- -26.2 - -15
- -15 - -10
- -10 - -5
- -5 - 0
- 0 - 1.95
- 2000 Shoreline
- 2018 Shoreline
- TV13a Project Boundary

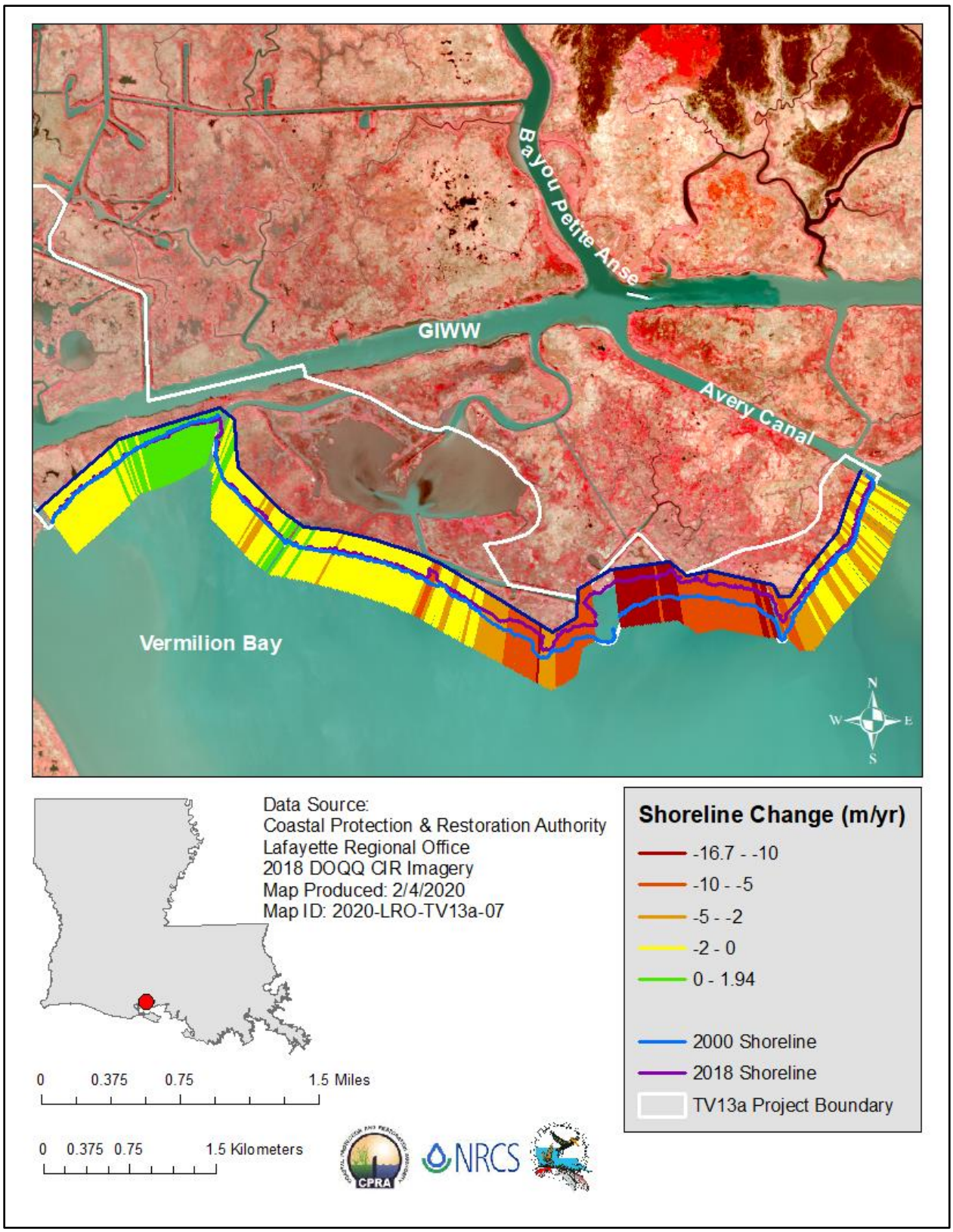


Figure ~~12~~13. Shoreline change along the shore of Vermilion Bay during the period 2000-2018.

Water Level:
Pre- and post-construction data for the project area station TV13-01 and reference stations TV13-2R, TV13-3R, and TV13-4R was collected in 30 s intervals from 02/05/1999 – 09/02/1999 and 02/24/2003 – 09/09/2003 (Figure 14). This time interval illustrates the rapid water level changes (boat wake induced) common in the project and reference areas. Short-term water level variability (<1 hr) decreased in the reference stations as a function of distance from the source of disturbance (i.e. the GIWW). Short-term water level variability was significantly lower in the project area following construction and significantly lower than the reference stations (P<0.0001).

Vegetative Shoreline Protection:
Prior to the installation of *Spartina alterniflora* plantings in 2000, shoreline vegetation consisted mainly of *Spartina patens*, *Schoenoplectus americanus* and *Vigna luteola*. Vegetation surveys conducted on 7/24/2001 indicated overall survival of *S. alterniflora* plants was 80%. Individual plants were indistinguishable from each other in all plots where plants survived. The remaining plots had no surviving vegetation. Cover estimates ranged from 3-100% with mean cover for surviving plots at 59%. Average plant height was 45.9 in (116.6 cm). Because individual plants were indistinguishable in all surviving plots in 2001, no further surveys were conducted.

CRMS Supplemental

Hydrologic:
Hydrologic indices in 2019 were comparable to previous years except for 2018 when they were much lower at CRMS0527 (reference) and CRMS0532 (project) (Table 2). Reference site CRMS0527 had the largest HI drop from 100 in 2017 to 40 in 2018. This is likely due to percent time flooded values increasing from 29.5 % in 2017 to 43.3% in 2018 as this site is most exposed. This site, along with CRMS0532 bounced back in 2019 and these two sites scores performed higher than other intermediate sites within the Teche/Vermilion basin and coastwide (Figures 15 and 17). Reference site CRMS0531 remained relatively stable. CRMS0531 scored higher when compared to other intermediate sites within the Teche/Vermilion basin and coastwide (Figure 16).

Elevation Change, Accretion and Land Area:
Elevation change at both reference (CRMS0531 and CRMS0527) and project (CRMS0532) sites has been slightly rising since 2008 (Figures 18, 19 and 20) at 0.54 cm/yr, 0.82 cm/yr and 0.52 cm/yr, respectively. Similarly, accretion rates have risen as well. From 2008-2018 accretion rates at CRMS0531 were 1.29 cm/yr; during 2007-2018 rates at CRMS0527 were 1.65 cm/yr and for CRMS0532 from 2007-2018 rates were 1.66cm/yr.

Soil elevation change when compared to original marsh elevations and hydrologic prisms generate the CRMS site Submerged Vulnerability Index (SVI) values (Figures 21, 22 and 23). SVI at CRMS0527 and CRMS0531 (reference sites) as well as at CRMS0532 (project site) continued to remain above the 90th percentile of the hydrologic datum. This indicates that these sites rarely see surface flooding during normal water levels. These SVI scores can then be

compared on larger spatial scales such as marsh type, basin and coastwide (Figures 24, 25 and 26). Again, when compared to these larger spatial scales all three CRMS sites continued to be at the top of the SVI values.

Long term land area data, 1985-2016, indicate a -0.46% change at CRMS0527 (reference), a 0.03% change at CRMS0531 (reference) and a -0.03% change at CRMS0532 (project). This is reasonable considering that CRMS0527 is the most exposed site, followed by CRMS0532, and CRMS0531 being the most northern and most protected site (Figures 27–29).

Vegetation:

Analysis of the vegetation data indicated that percent cover has fluctuated between 50-75% over the last few years at CRMS0527 (reference area) and between 60-80% at CRMS0531 (reference area). While CRMS0527 saw a decline since 2018 (from around 75% cover to around 50% cover), CRMS0531 has seen a slight increase (60% cover to 75% cover). The project area, CRMS0532, held somewhat steady the last few year with percent cover ranging from 72% to near 85%, however, percent cover took a steep decline in 2019 to around 40%. (Figures 30-32). This is most likely due to damage from Hurricane Barry in July of 2019. FQI scores dropped from 48.9 to 45.02 at CRMS0527 and increased from 56.5 to 57.97 at CRMS0531. When compared to other intermediate sites, the Teche/Vermilion basin and coastwide, CRMS0527 scored much lower on the FQI scale while CRMS0531 scored on the higher end compared to these other scales (Figures 33 and 34). The project area showed an increase in percent cover through 2009, with a large decline in 2010. This is mostly the result of a large drop in percent cover of *Schoenoplectus americanus*. This decrease does not appear to be related to Hurricanes Gustav and Ike, which affected the southwestern coast of Louisiana in 2008. In fact, these two hurricanes appear to have had no impact on percent cover and FQI at any of these CRMS sites. It then began to stabilize until 2014 (FQI 57.8) before decreasing again in 2015 (FQI 48.3). There was another dip in FQI in 2017, a rise in 2018 and another large decline in 2019 (FQI 23.44). This significant decline is more than likely due to damage caused by Hurricane Barry. Compared to other brackish sites, the Teche/Vermilion basin and coastwide, CRMS0532 had a significantly lower FQI score (23.45) (Figure 35).

Soils:

The soil properties data for the project and reference (CRMS0527) showed soil bulk density was lower in the project area than the reference and tended to be highest at the surface and below 20 cm (Figures 36a,b and 37a,b). Overall, bulk densities for both sites were relatively low, ranging from approximately 0.3-0.5 g/cm^3. Analysis of soil organic matter content indicated that organic content was higher in the project area than the reference site. This is also reflected in the project site's lower bulk density as bulk density usually decreases as organic matter content increases. Organic matter content was lowest at the surface and increased with depth for both sites.

Soil porewater salinities for both reference sites (CRMS0527 and CRMS0531) and the project site (CRMS0532) ranged from around 0.5 ppt to around 10 ppt (Figures 38-40). Porewater salinity in the project area, however, was slightly higher than surface salinities while the reference areas tracked well with surface salinities. Data collected since site installation was

summarized by calculating daily means from the hourly data and then calculating monthly means of the daily means.

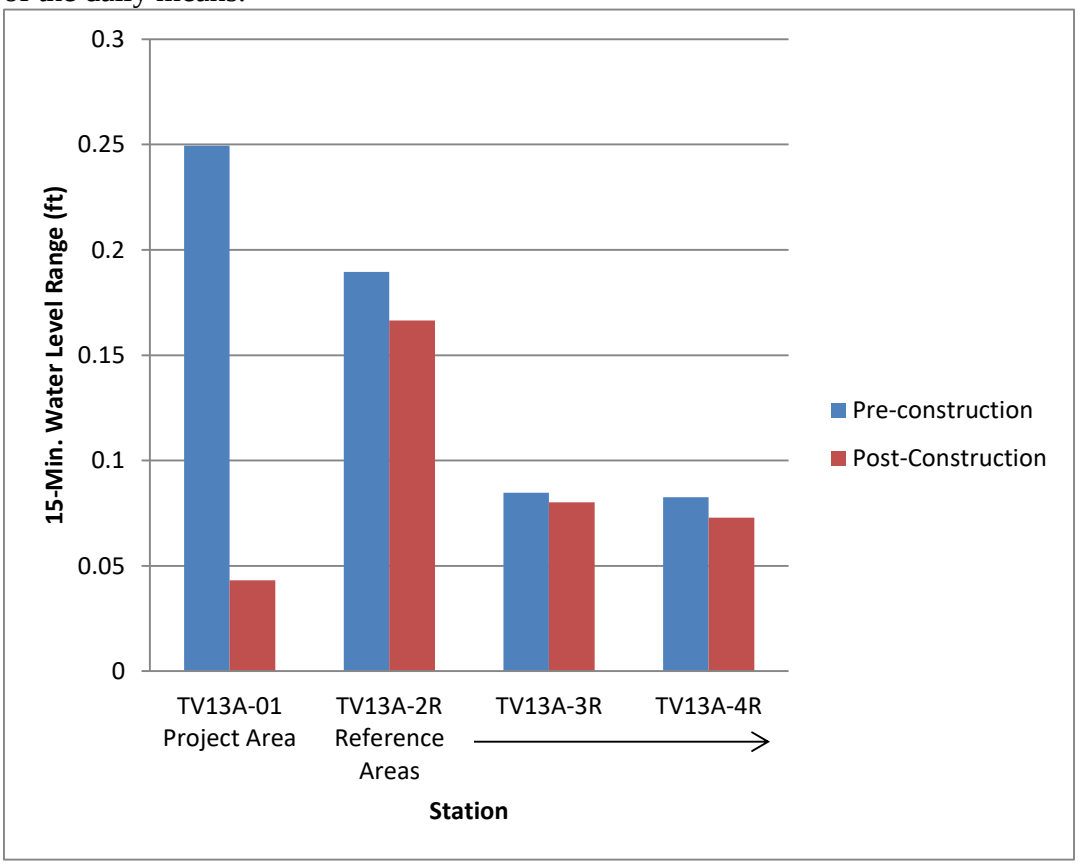


Figure ~~13~~14. Relative daily water level variability (ft) both pre- and post-construction for the project and reference stations.

Table 2. Comparison of Hydrologic Index at CRMS0527, CRMS0531 and CRMS0532 between 2015 - 2019.

	Hydrologic Index				
	2015	2016	2017	2018	2019
CRMS0527 (Reference)	48	89	100	40	87
CRMS0531 (Reference)	71	91	96	82	97
CRMS0532 (Project)	62	87	82	56	94

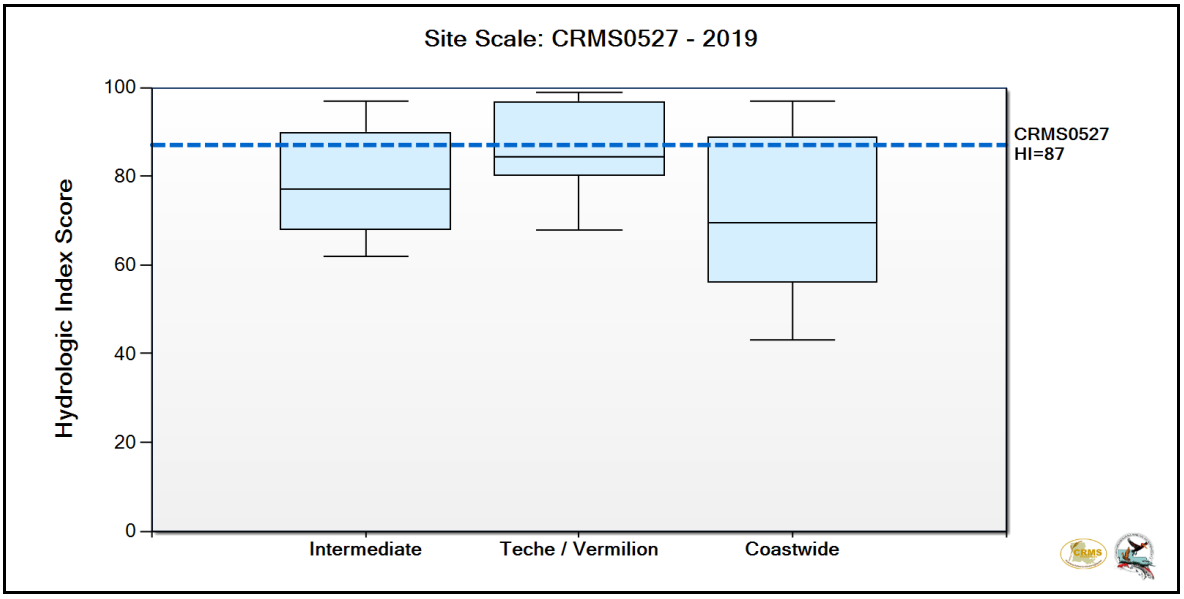


Figure ~~14~~15. Hydrologic Index Score for CRMS0527 (Reference) in 2019 compared to the distribution of scores for all coastwide sites within the intermediate marsh type, within the Teche/Vermilion basin, and across the entire Louisiana coastal zone.

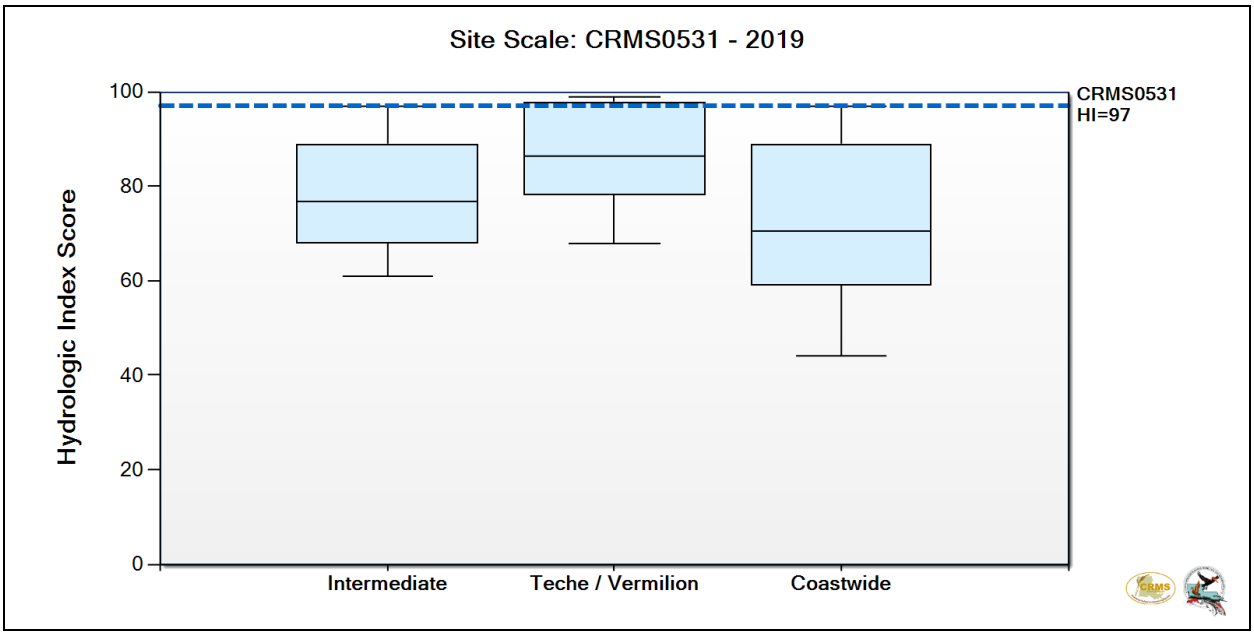


Figure ~~15~~16. Hydrologic Index Score for CRMS0531 (Reference) in 2019 compared to the distribution of scores for all coastwide sites within the intermediate marsh type, within the Teche/Vermilion basin, and across the entire Louisiana coastal zone.

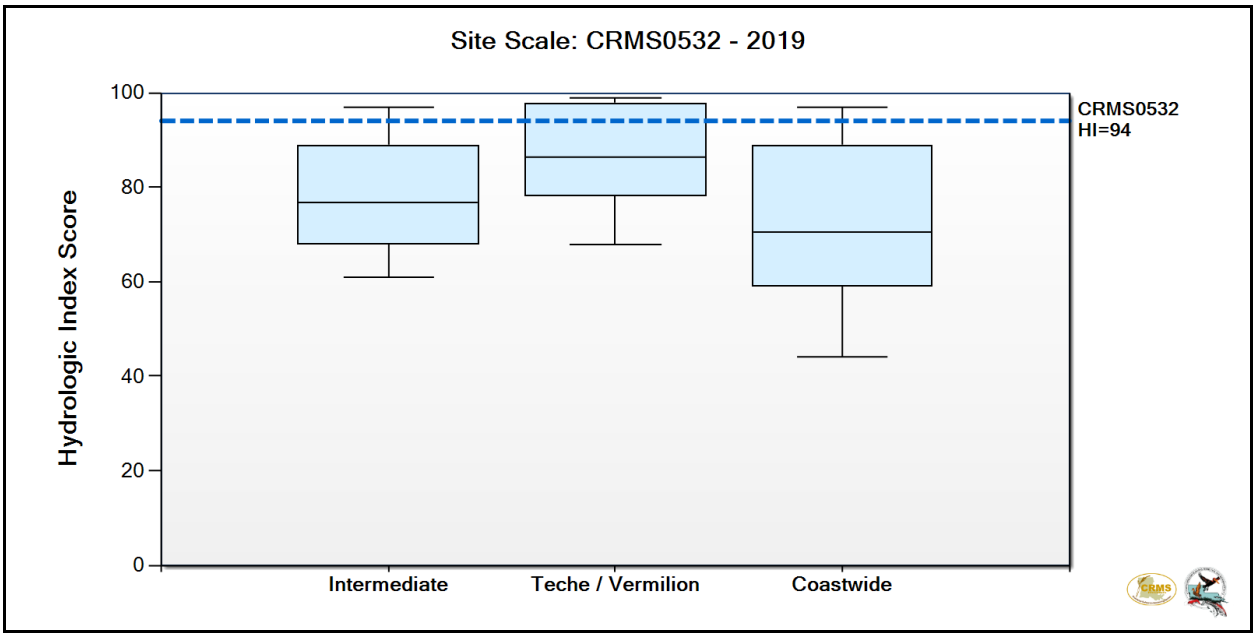


Figure ~~16~~17. Hydrologic Index Score for CRMS0532 (Project) in 2019 compared to the distribution of scores for all coastwide sites within the intermediate marsh type, within the Teche/Vermilion basin, and across the entire Louisiana coastal zone.

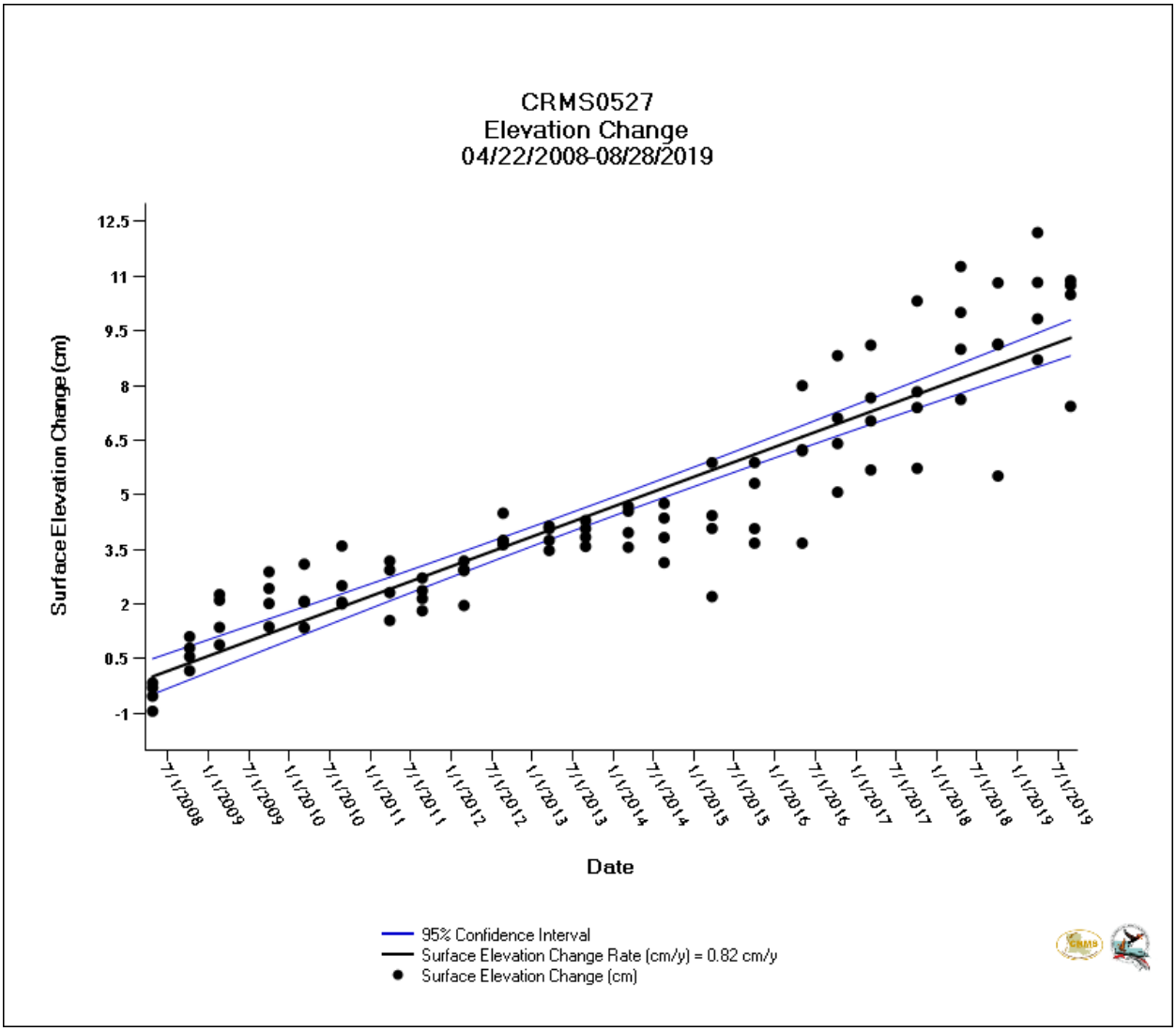


Figure ~~17~~18. Elevation change per year at CRMS0527 (Reference).

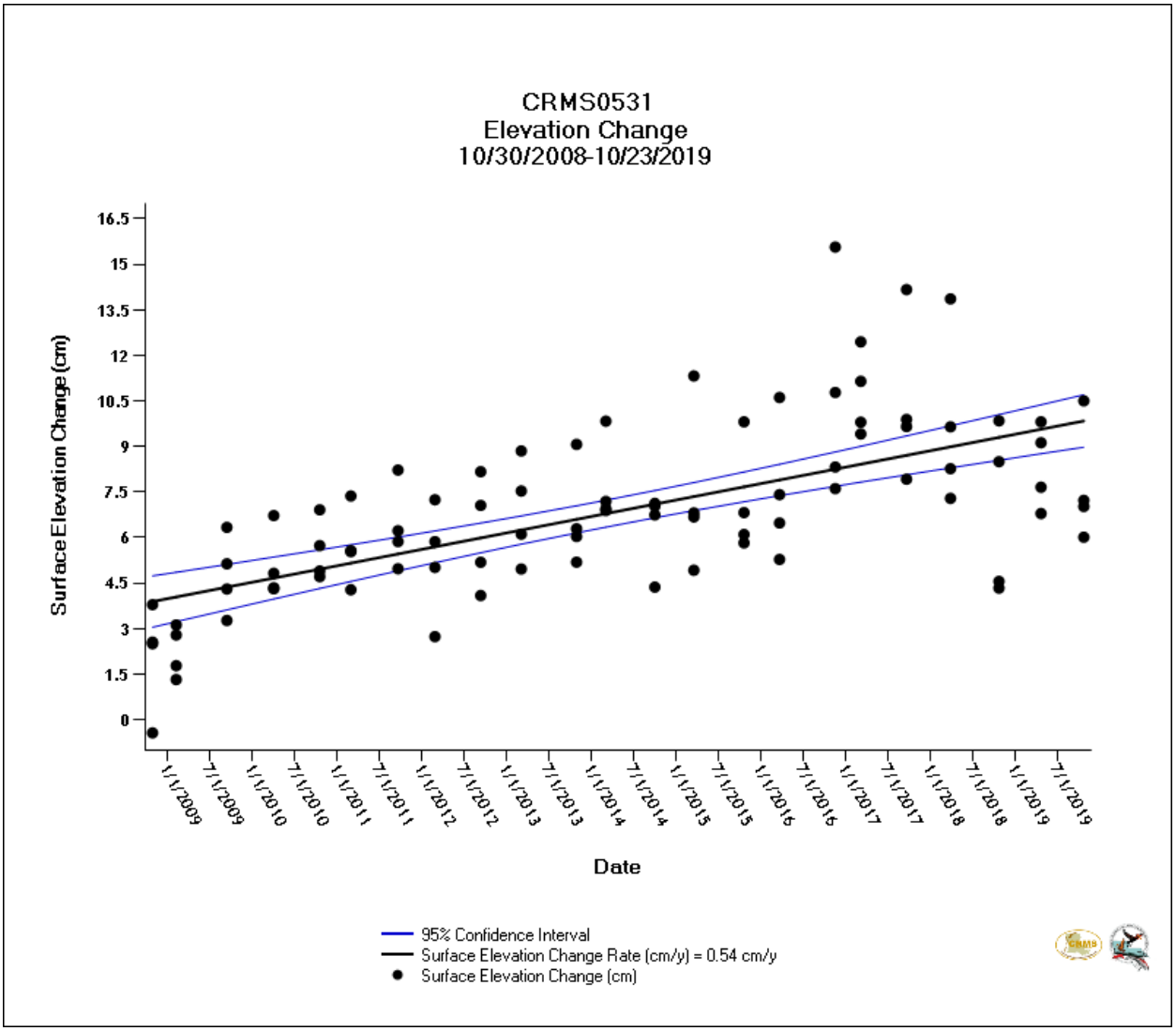


Figure ~~18~~19. Elevation change per year at CRMS0531 (Reference).

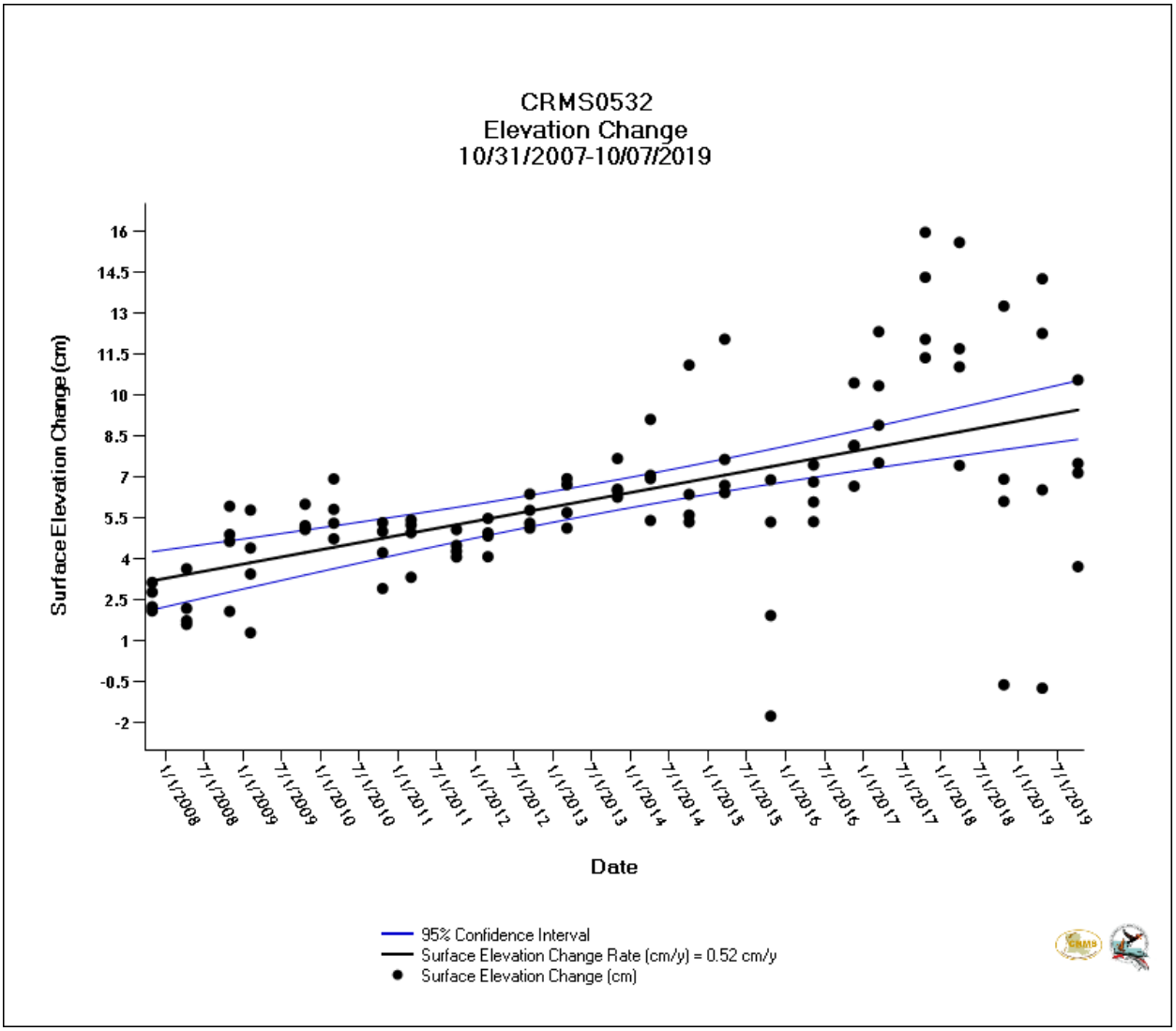


Figure ~~19~~20. Elevation change per year at CRMS0532 (Project).

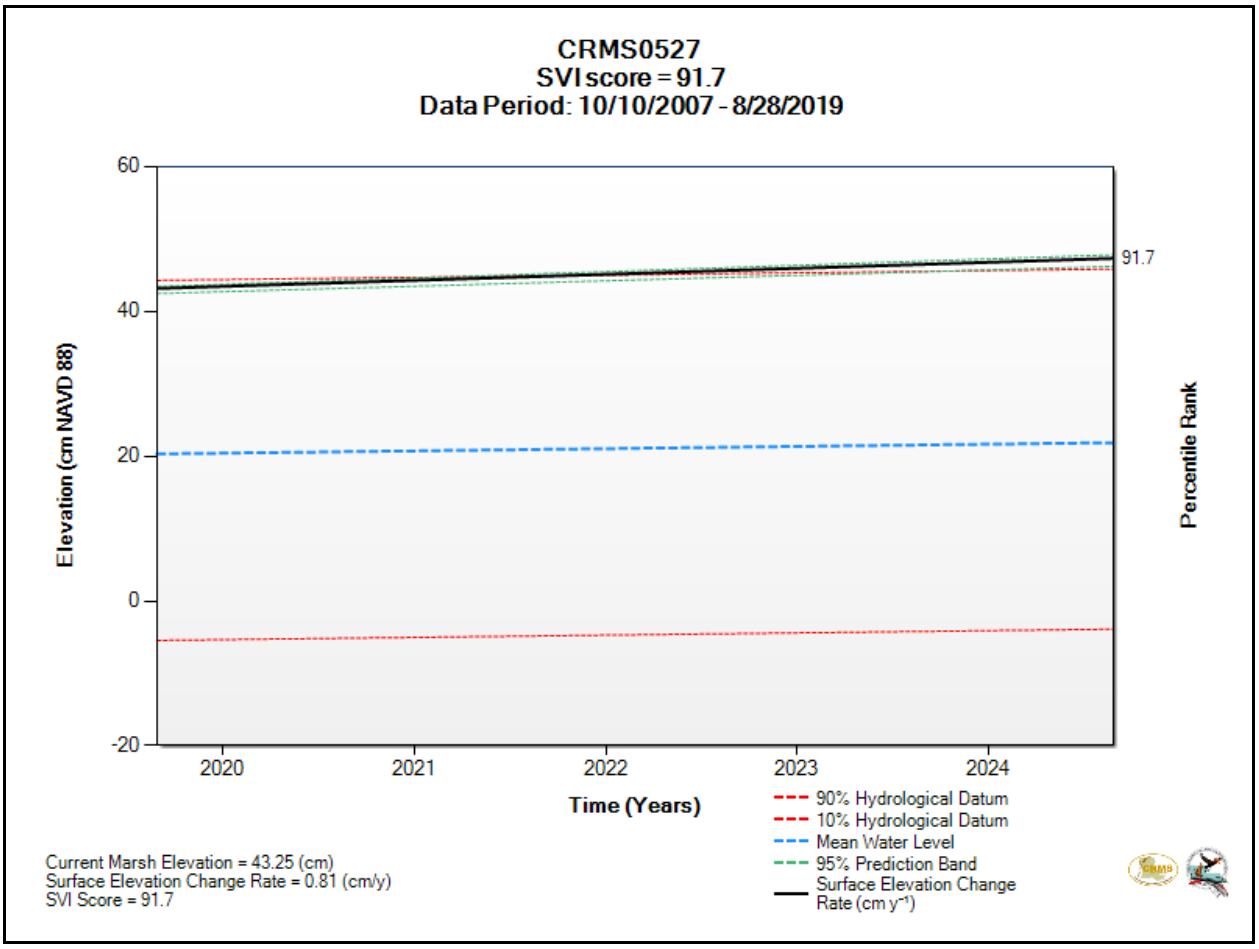


Figure ~~20~~21. Submerged Vulnerability Index (SVI) of CRMS0527 (Reference).

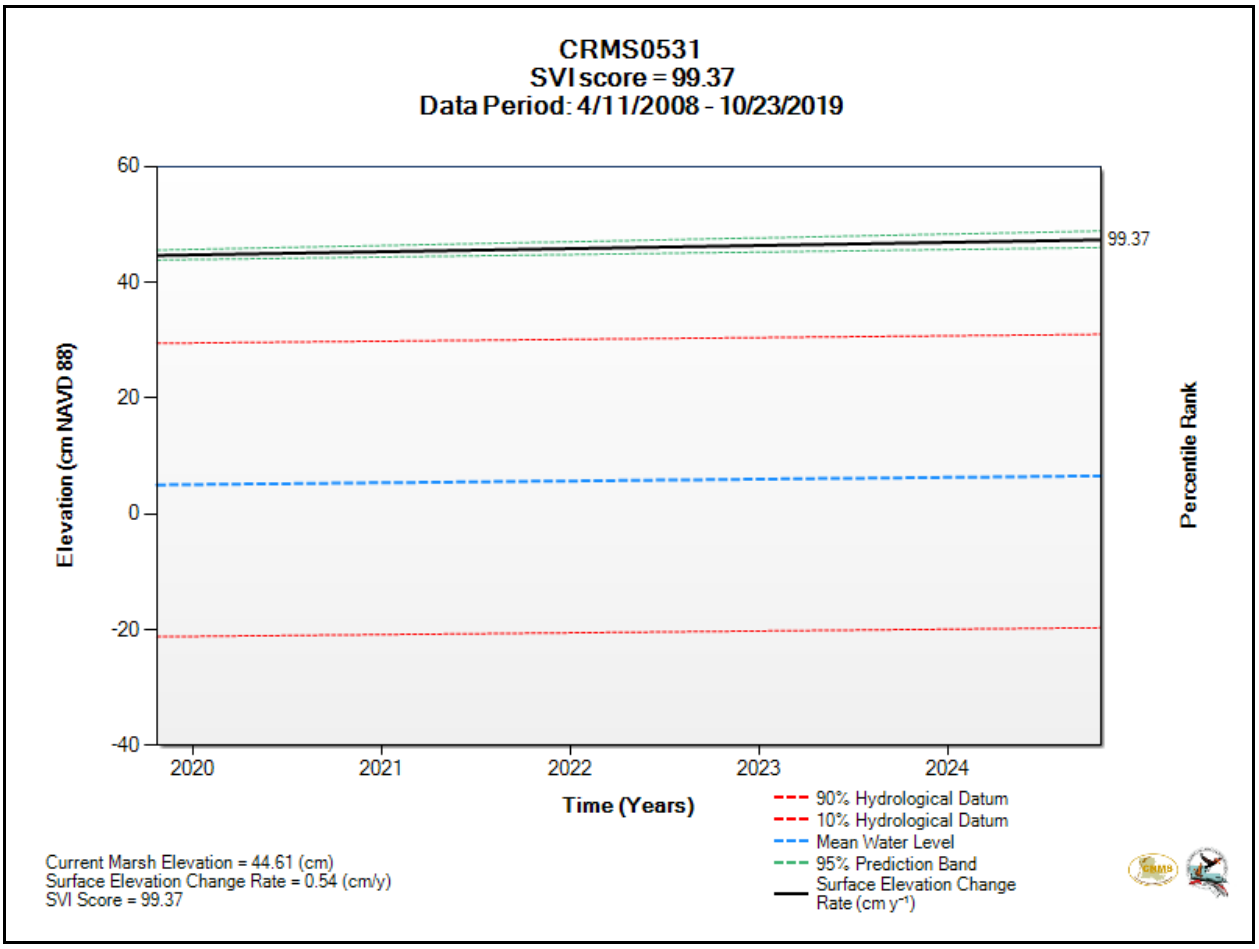


Figure ~~21~~22. Submerged Vulnerability Index (SVI) of CRMS0531 (Reference).

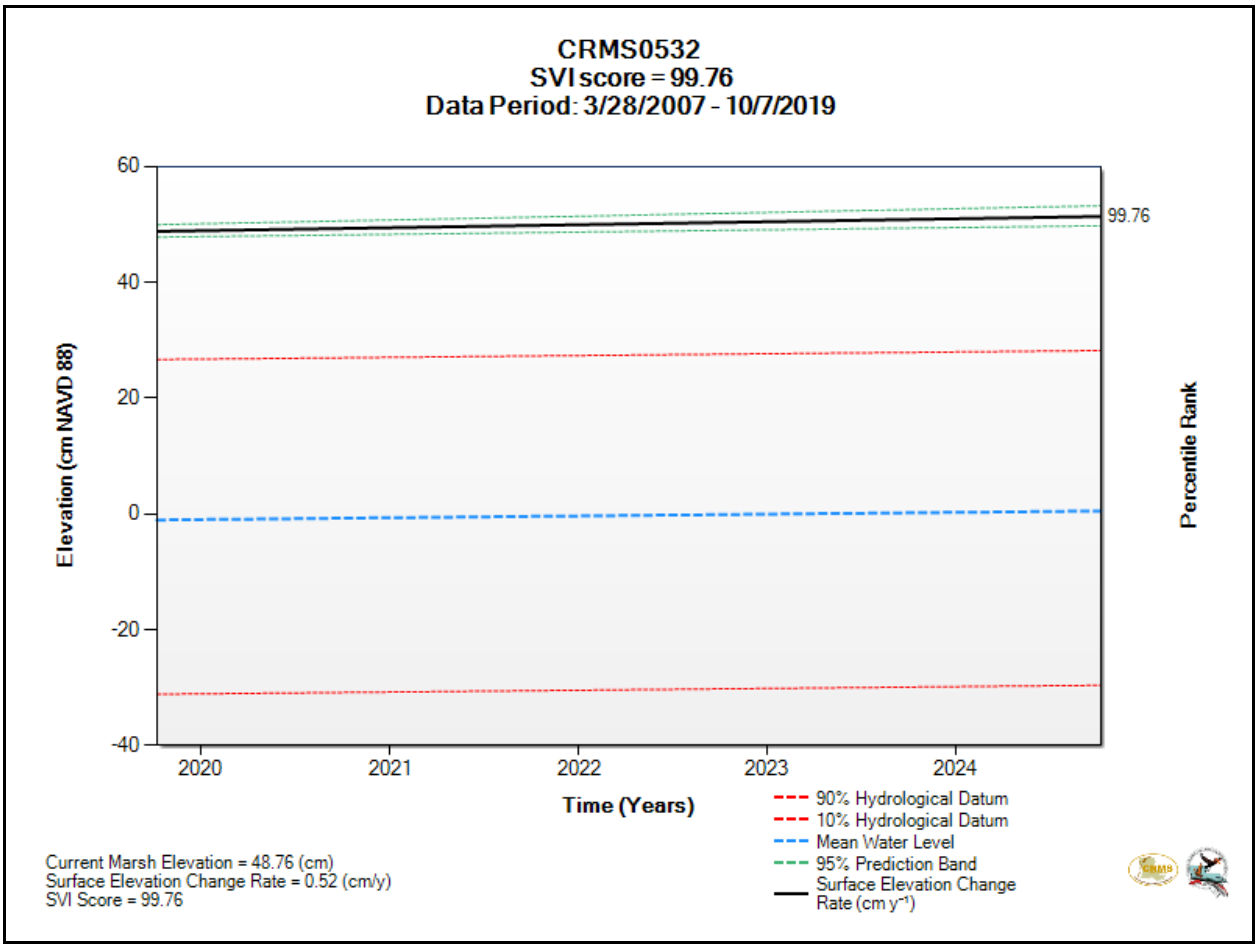


Figure ~~22~~23. Submerged Vulnerability Index (SVI) of CRMS0532 (Project).

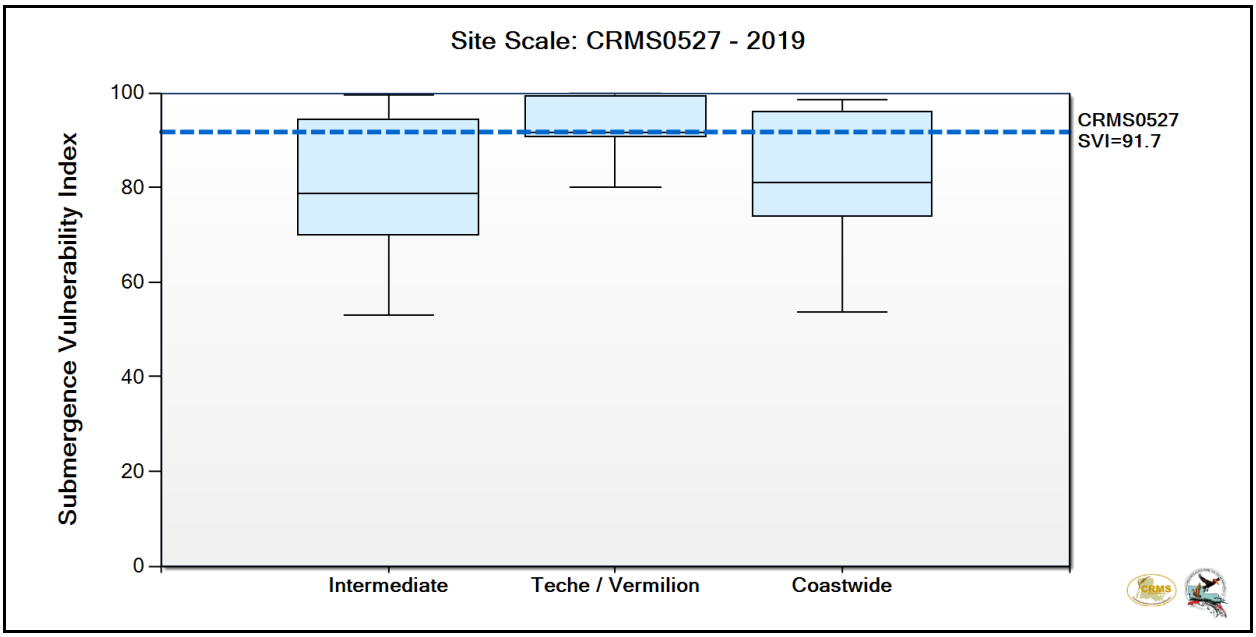


Figure ~~23~~24. Submerged Vulnerability Index (SVI) of CRMS0527 (Reference) compared to multiple spatial scales to provide a reference for site performance.

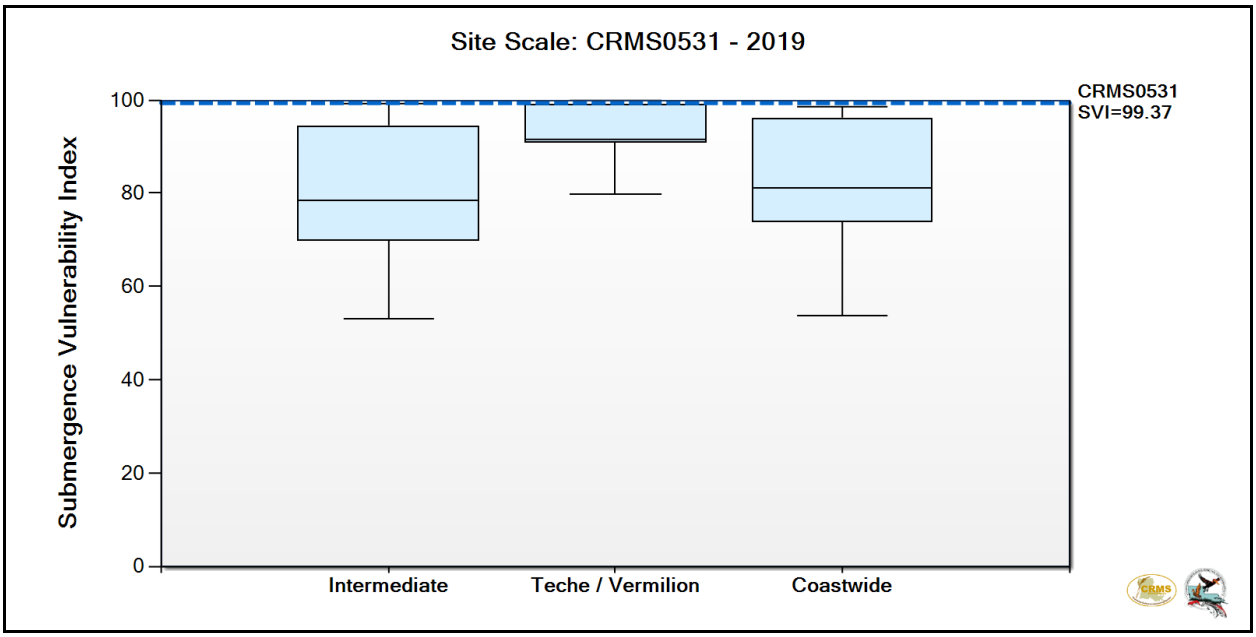


Figure ~~24~~25. Submerged Vulnerability Index (SVI) of CRMS0531 (Reference) compared to multiple spatial scales to provide a reference for site performance.

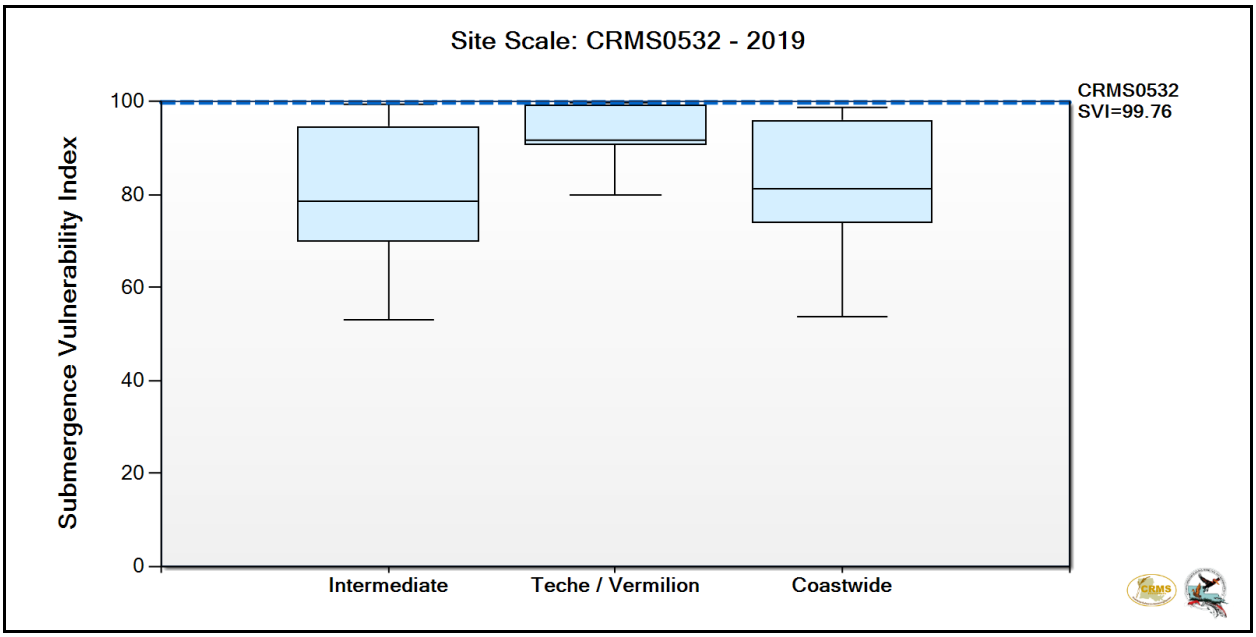


Figure ~~25~~26. Submerged Vulnerability Index (SVI) of CRMS0532 (Project) compared to multiple spatial scales to provide a reference for site performance.

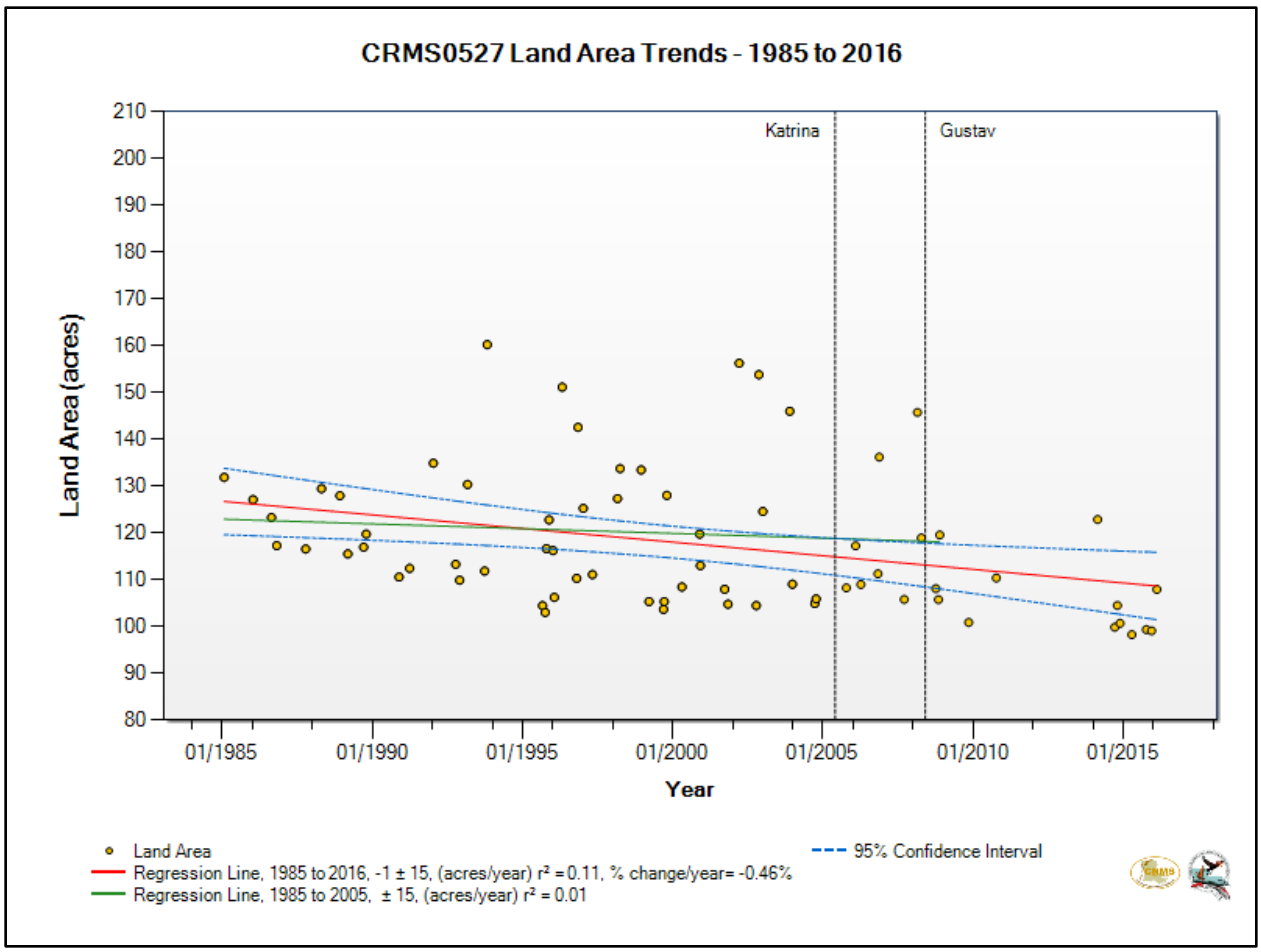


Figure 27. Percent land area change at CRMS0527 (Reference) from 1985 – 2016.

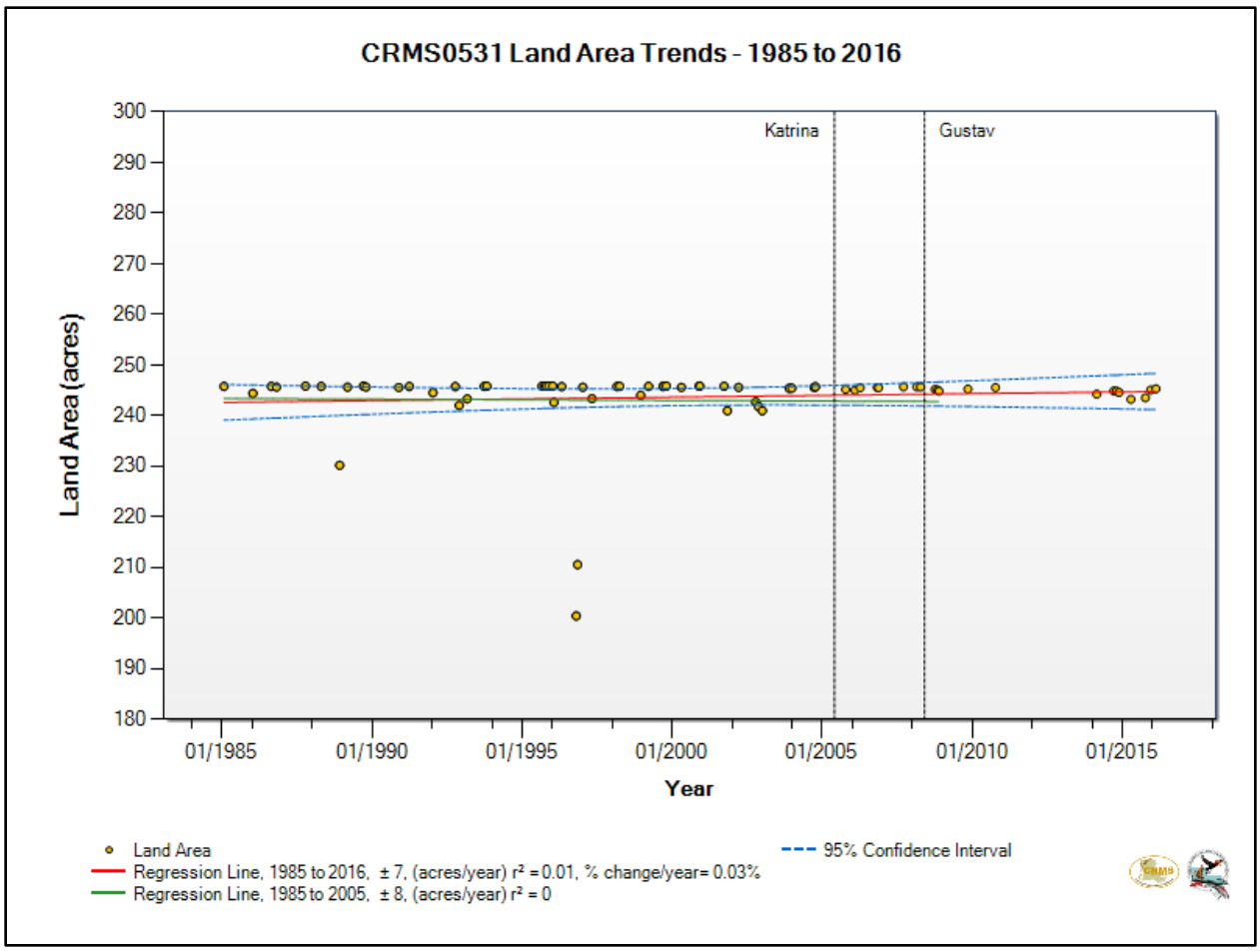


Figure 28. Percent land area change at CRMS0531(Reference) from 1985 – 2016.

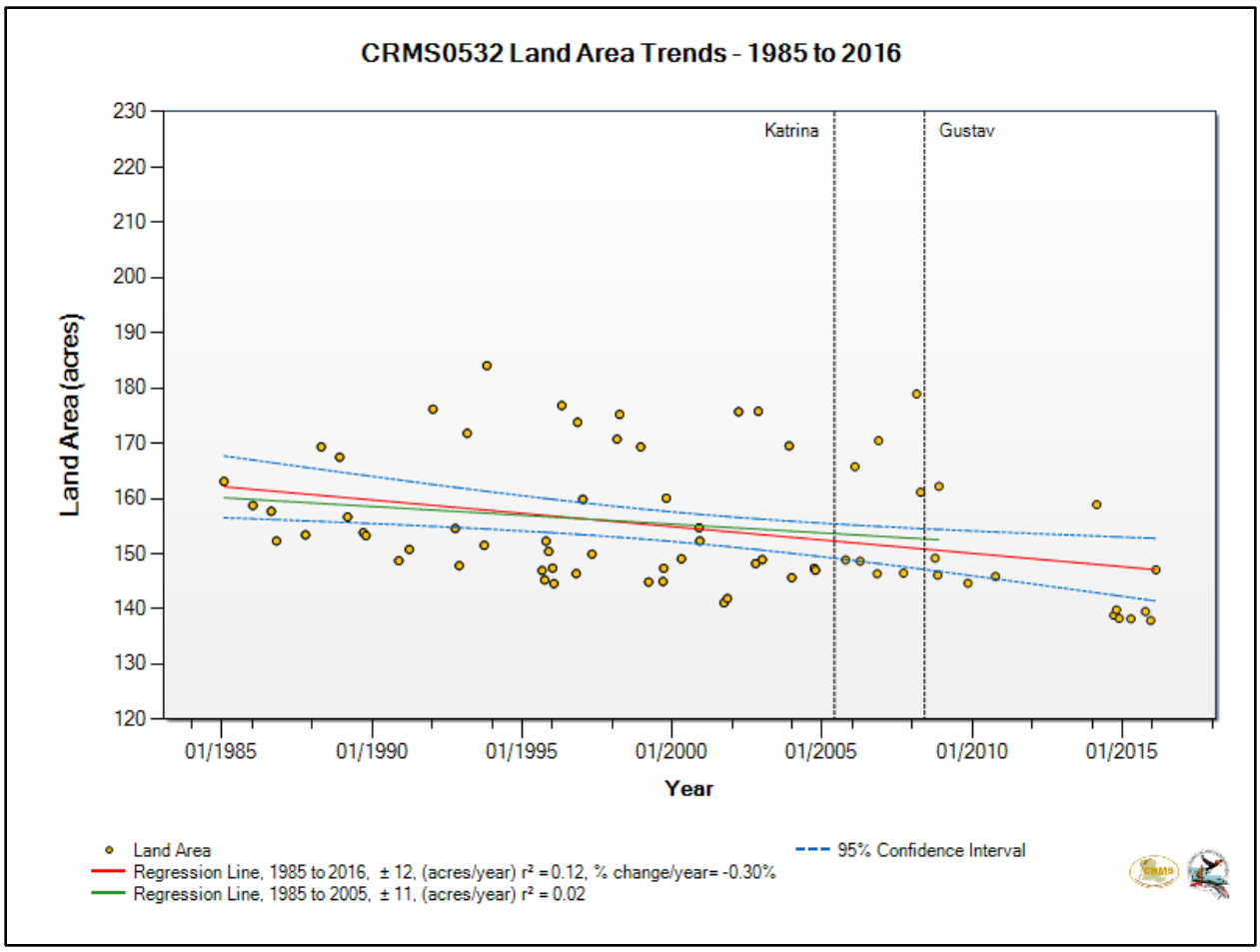


Figure 29. Percent land area change at CRMS0532 (Project) from 1985 – 2016.

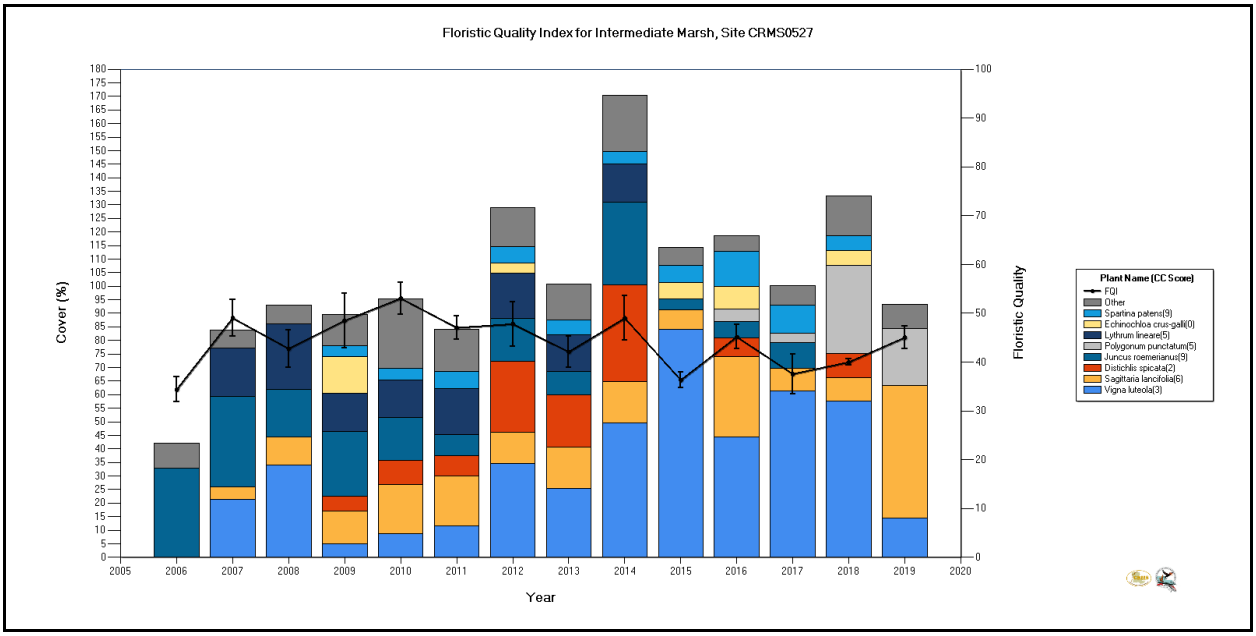


Figure ~~26~~30. Vegetative composition and Floristic Quality Index for CRMS site 527 (reference site) since sampling began. Values are means of 10 stations within the site; therefore, the sum of percent coverage of individual species can be greater than 100 %.

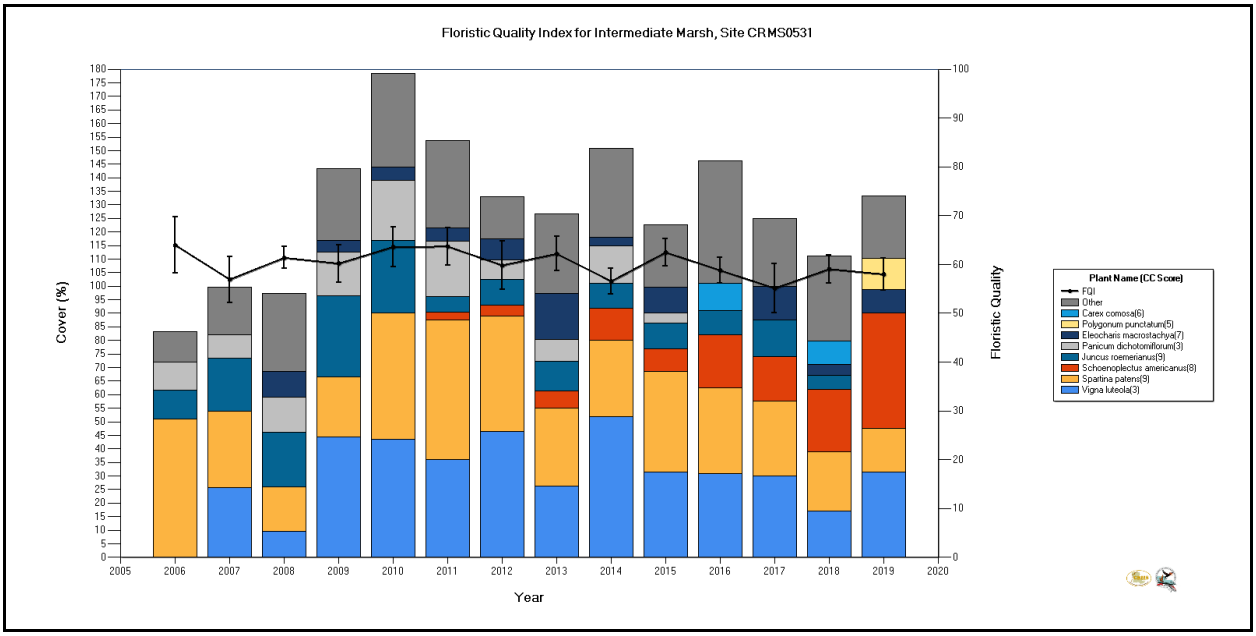


Figure ~~27~~31. Vegetative composition and Floristic Quality Index for CRMS site 531 (reference site) since sampling began. Values are means of 10 stations within the site; therefore, the sum of percent coverage of individual species can be greater than 100 %.

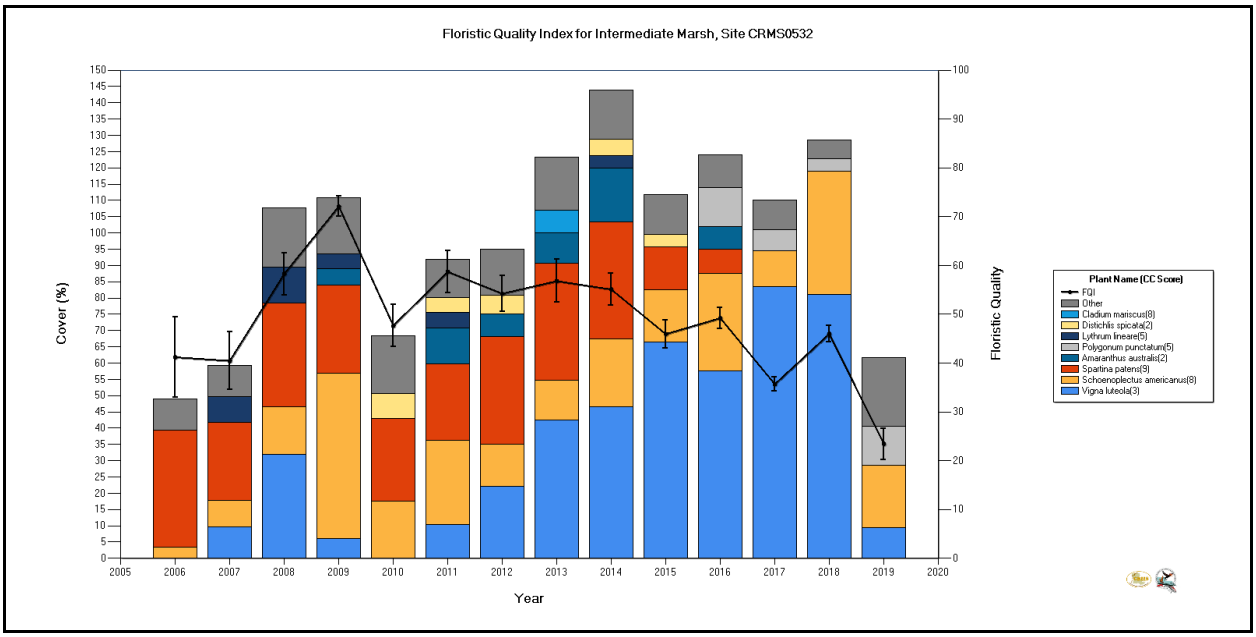


Figure ~~28~~32. Vegetative composition and Floristic Quality Index for CRMS site 532 (project) since sampling began. Values are means of 10 stations within the site; therefore, the sum of percent coverage of individual species can be greater than 100 %.

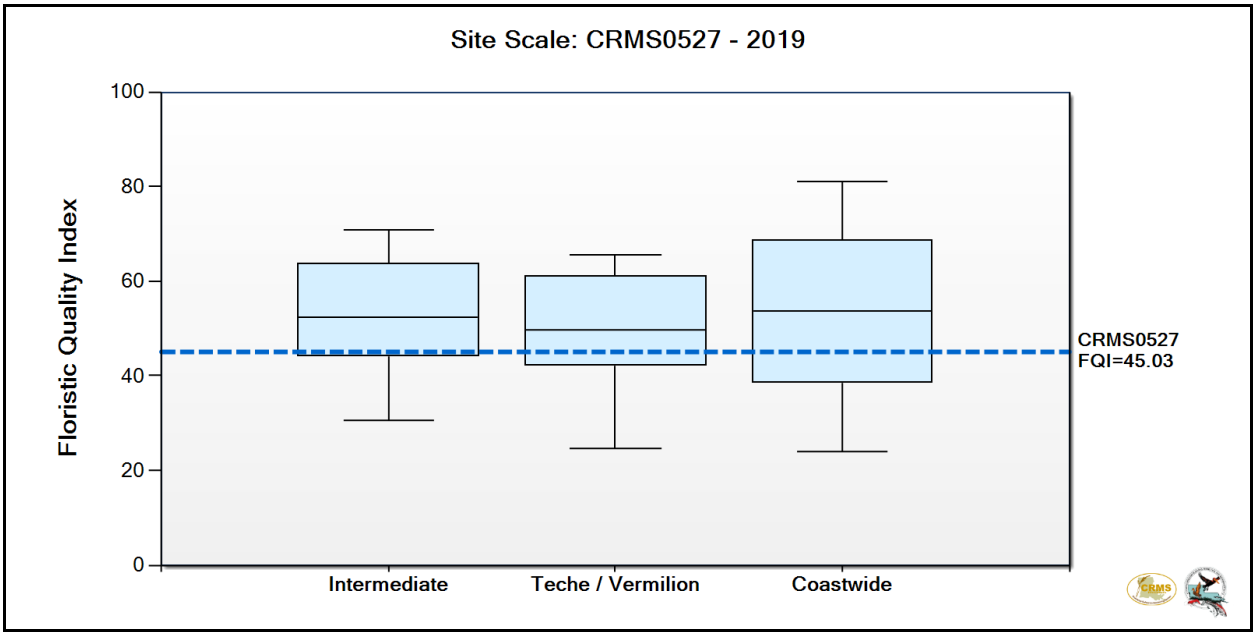


Figure ~~29~~33. Floristic Quality Index (FQI) for CRMS0527 (Reference) in 2019 compared to the distribution of scores for all coastwide sites within the intermediate marsh type, within the Teche/Vermilion basin, and across the entire Louisiana coastal zone.

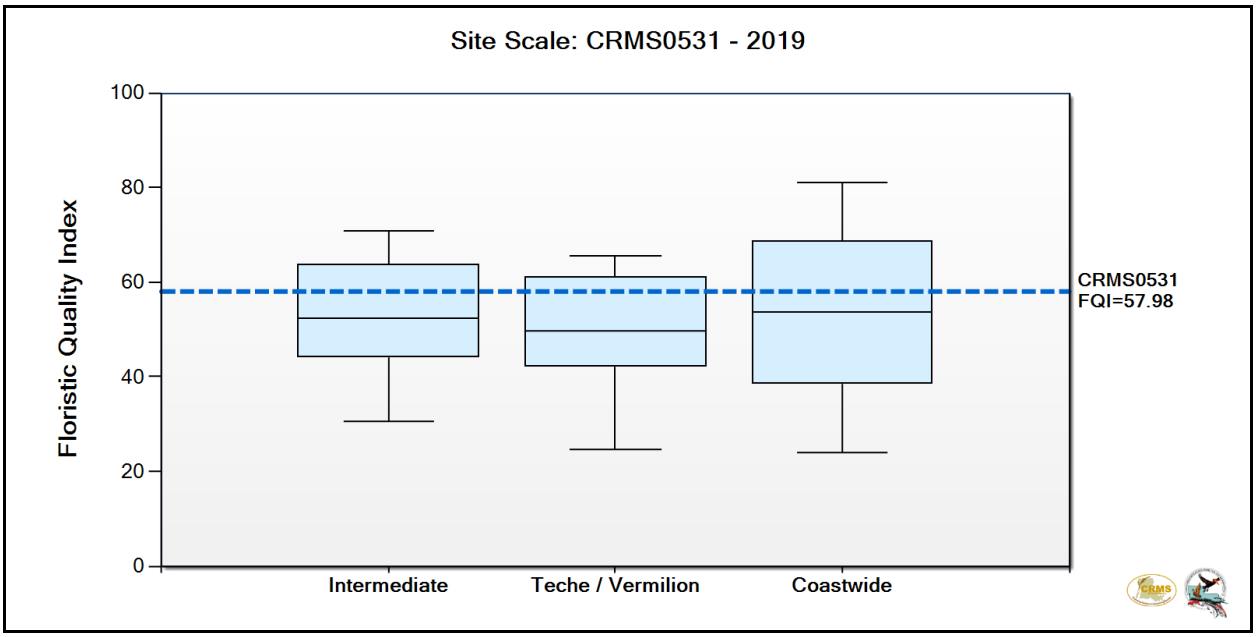


Figure ~~30~~34. Floristic Quality Index (FQI) for CRMS0531 (Reference) in 2019 compared to the distribution of scores for all coastwide sites within the intermediate marsh type, within the Teche/Vermilion basin, and across the entire Louisiana coastal zone.

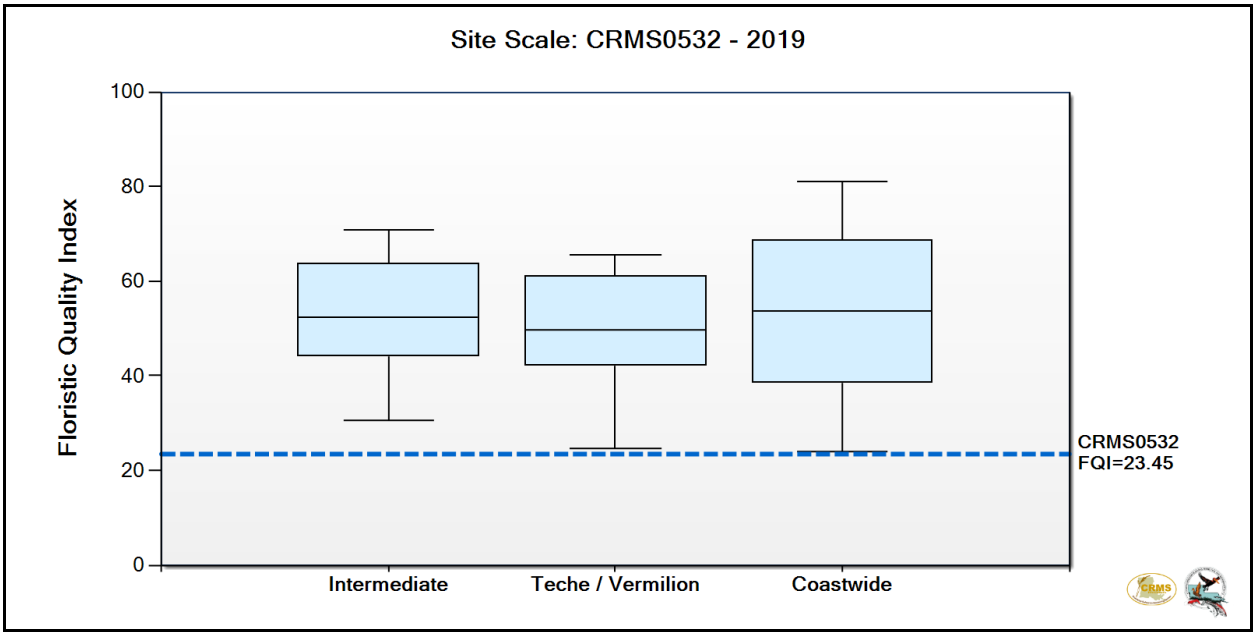
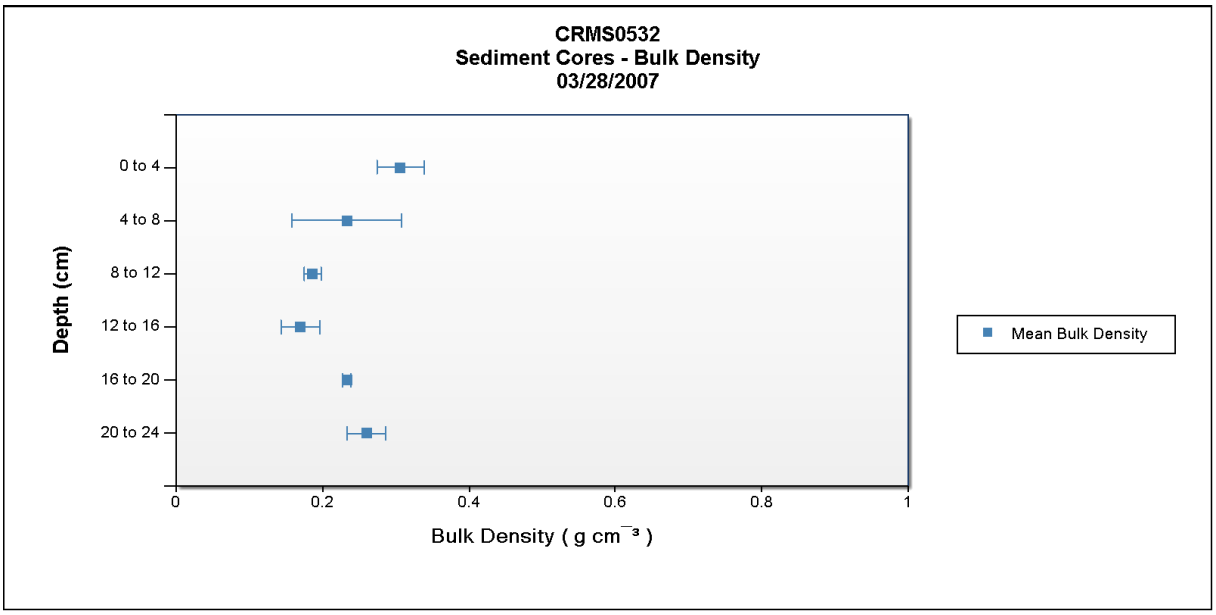
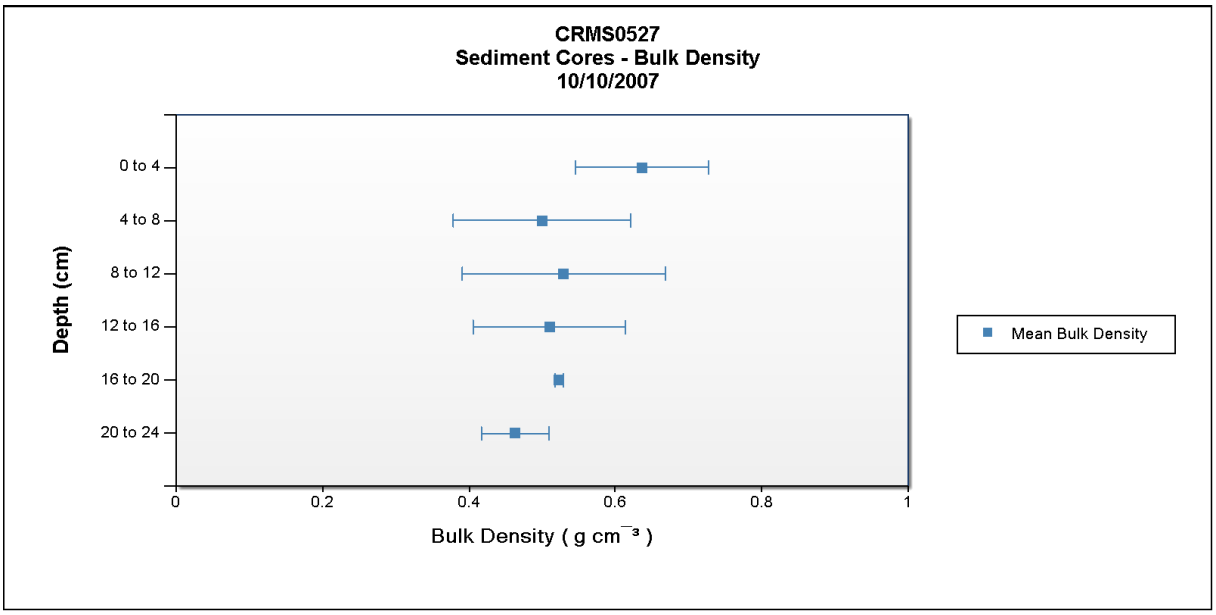
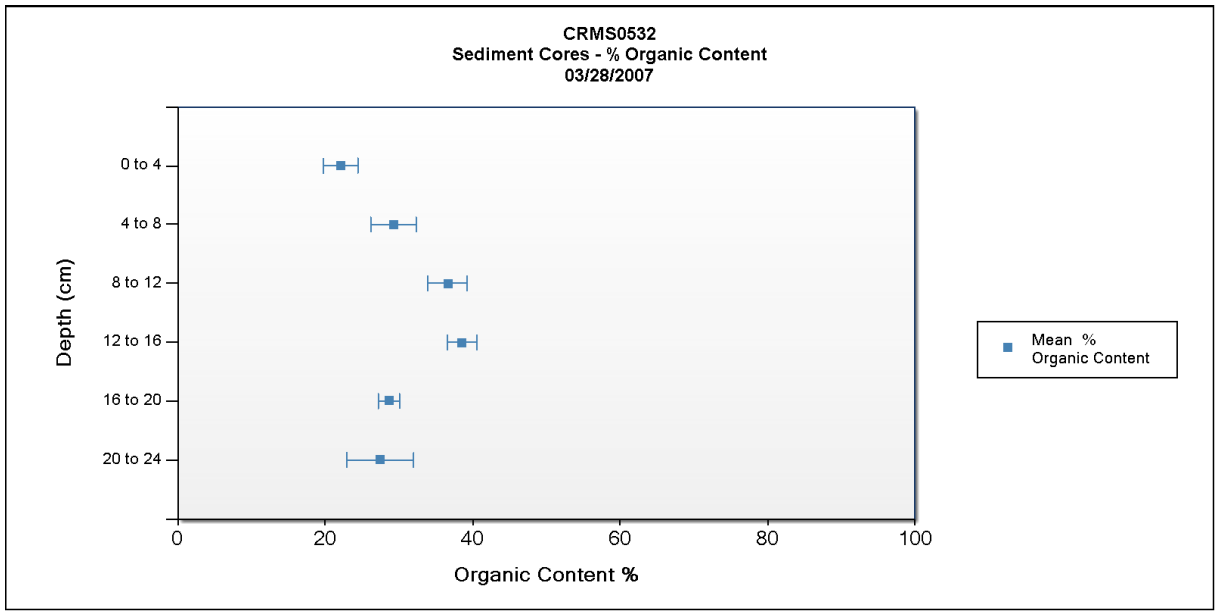


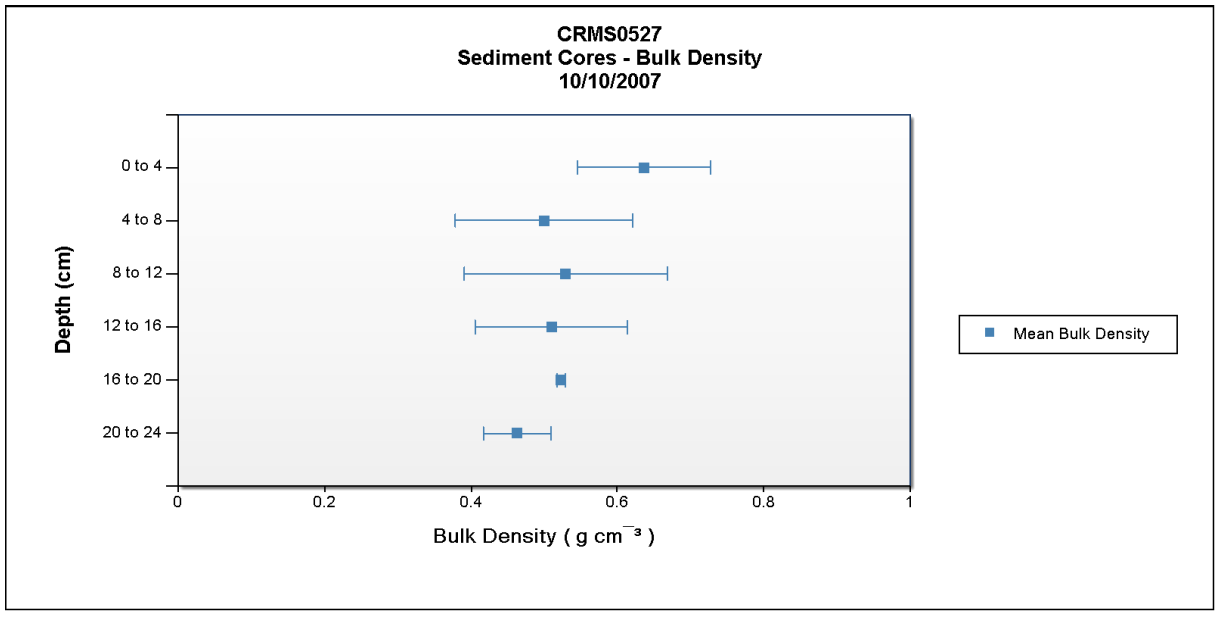
Figure ~~31~~35. Floristic Quality Index (FQI) for CRMS0532 (Project) in 2019 compared to the distribution of scores for all coastwide sites within the intermediate marsh type, within the Teche/Vermilion basin, and across the entire Louisiana coastal zone.





Figures ~~32a~~ ~~3~~6a and ~~32b~~3~~6~~b. Soil bulk density comparison of CRMS0532 (project) and CRMS0527 (reference).





Figures ~~33a~~ 37a and ~~33b~~37b. Soil organic matter content comparison of CRMS0532 (project) and CRMS0527 (reference).

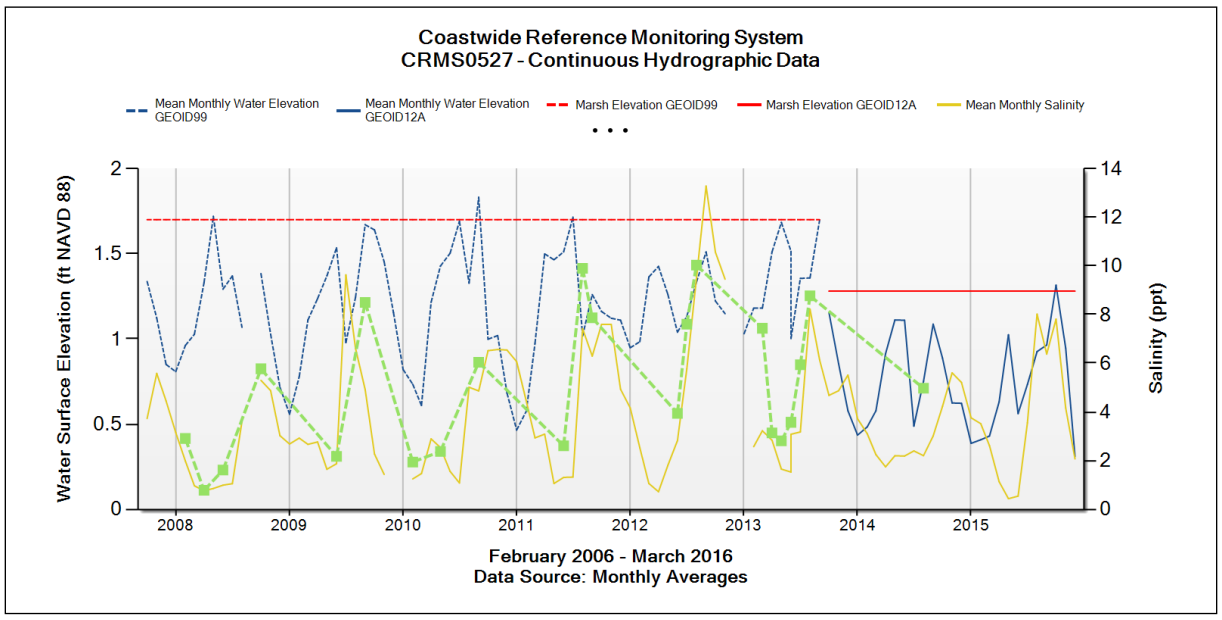


Figure ~~343~~8. Surface water and soil porewater salinities for CRMS0527 (Reference).

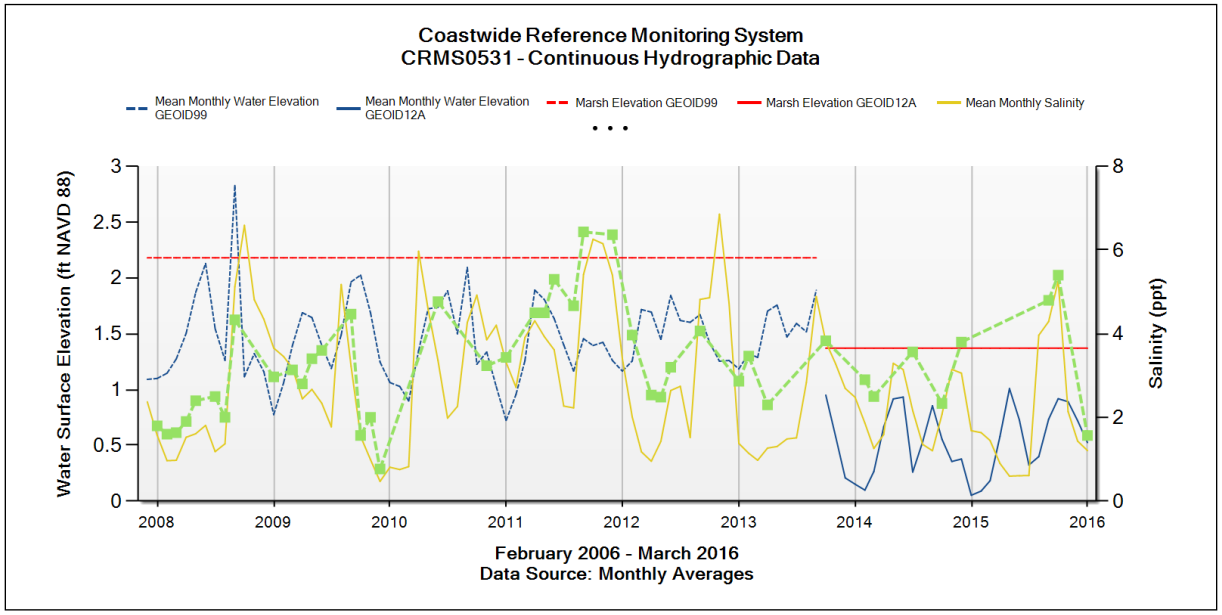


Figure ~~353~~9. Surface water and soil porewater salinities for CRMS0531 (Reference).

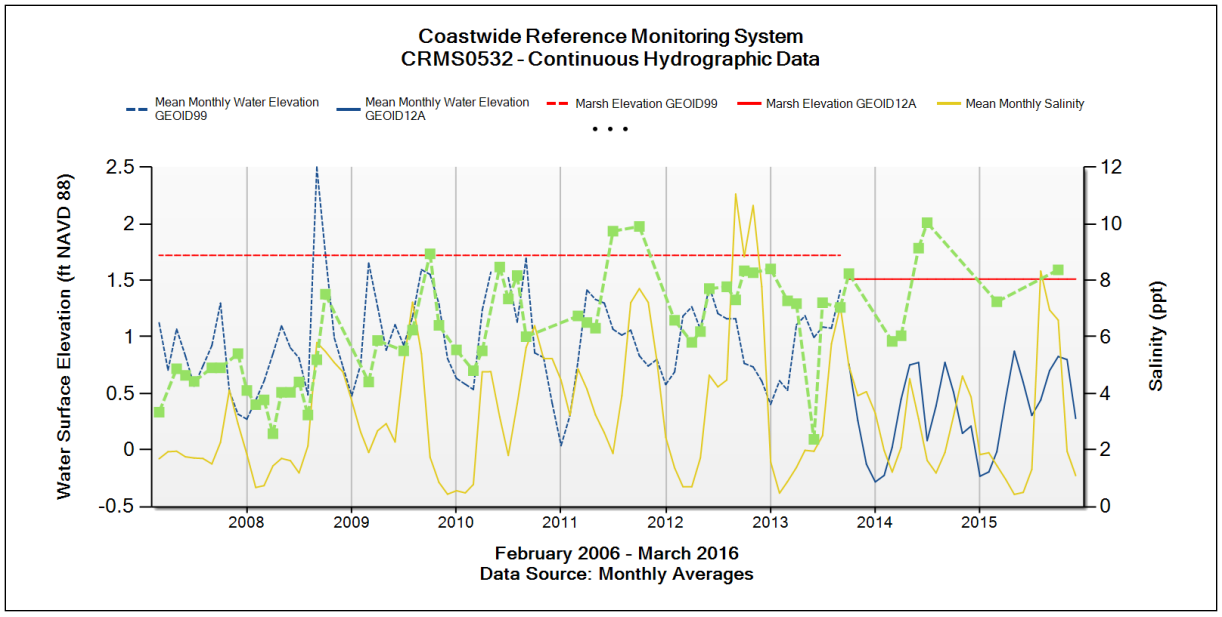


Figure ~~36~~40. Surface water and soil porewater salinities for CRMS0532 (Project).

V. Conclusions

a. Project Effectiveness

The rock dike constructed along the GIWW has been effective in achieving the goals of reducing erosion rates and allowing for bankline expansion along its stretch of shoreline. The vegetative shoreline plantings along the Vermilion Bay shoreline, however, have not provided protection from erosion. Erosion continues along this stretch of shoreline, which is more susceptible to wave action and storm events.

From an engineering standpoint, the Oaks/Avery Canals Hydrologic Restoration Project features are in good condition with the exception of the Cow Path weir. CPRA and NRCS have requested funding from CWPPRA to remove and replace the Cow Path weir. Funding was approved on November 13, 2020. Engineering and Design will be tasked at the beginning of 2021, with construction anticipated for 2022.

b. Recommended Improvements

Shoreline protection measures are recommended for those portions of the Vermilion Bay shoreline exhibiting the highest erosion rates. As mentioned above, rock installment could be beneficial in abating erosion along the Vermilion Bay bankline.

c. Lessons Learned

Rock dikes installed for erosion control seem to provide sufficient protection against erosion as long as it is maintained. It is especially effective in more protected areas like along the GIWW. Shoreline plantings along banklines that see high wave action and are more exposed during storm events are not very effective and erosion in these areas will continue if left unprotected.

d. End of Project Life

The TV-13a project has successfully created additional marsh acreage where rock dikes were installed in areas that are more inland. In order for this additional acreage to sustain itself the rock should be maintained over time. Should the rock dike be left with no maintenance or removed completely, more than likely bankline erosion would continue and be exacerbated by storm events. As far as vegetative planting shoreline protection goes, it is doubtless this bankline will continue to erode.

VI. Literature Cited

Bourbaghs, M., Johnston, C.A., Regal, R.R., 2006. Properties and performance of the floristic quality index in Great Lakes coastal wetlands. Wetlands 26, 718-735.

Chabreck, R. H., and G. Linscombe 1968. Vegetative type map of the Louisiana coastal marshes. New Orleans: Louisiana Department of Wildlife and Fisheries. Scale 1:62,500.

_____. 1978. Vegetative type map of the Louisiana coastal marshes. New Orleans: Louisiana Department of Wildlife and Fisheries. Scale 1:62,500.

_____. 1988. Vegetative type map of the Louisiana coastal marshes. New Orleans: Louisiana Department of Wildlife and Fisheries. Scale 1:62,500.

Cohen, M.J., Carstenn, S., Lane, C.R., 2004. Floristic quality indices for biotic assessment of depressional marsh condition in Florida. Ecological Applications 14, 784-794.

Louisiana Department of Natural Resources – Coastal Restoration and Management Division, Coastal Engineering Division, and Coastal Restoration Division. 2004. *2004 Operations, Maintenance and Monitoring Report for Oaks-Avery Hydrologic Restoration Project (TV-13a).* Louisiana Department of Natural Resources, Coastal Restoration Division.

Mendelssohn, I. A., M. W. Hester, F. J. Monteferrante and F. Talbot 1991. Experimental dune building and vegetative stabilization in a sand-deficient barrier island setting on the Louisiana coast, USA. Journal of Coastal Research 7(1) :137-149.

Natural Resources Conservation Service 1998. Environmental Assessment, Oaks/Avery Canal Hydrologic Restoration Project, Vegetative Plantings. U. S. Department of Agriculture, Natural Resources Conservation Service, Iberia Parish, Louisiana. 5 pp.

O'Neil, T. 1949. Map of the southern part of Louisiana showing vegetation types of the Louisiana marshes. Louisiana Department of Wildlife and Fisheries New Orleans.

Steyer, G. D., and R. E. Stewart, Jr. 1992. Monitoring program for coastal wetlands planning, protection, and restoration acts projects. Open-file report no. 93-01. Lafayette, LA.: U.S. Geological Service, National Wetlands Center. 85 pp.

APPENDIX A
(Inspection Photographs)

Photo No. 1, Rock along north bank of GIWW showing capped dike

Photo No. 2, Rock revetment at Oaks Canal, west side

Photo No. 3, Rock dike extension at Oaks Canal, west side

Photo No. 4, Rock revetment at Oaks Canal, East side

Photo No. 5, Cow Path Structure

Photo No. 6, Rock plug gapped as part of maintenance event. (photo taken 07/02/2012)

Photo No. 7, Rock dike along south bank of GIWW

Photo No. 8, Spoilbank Maintenance along Oaks Canal

Photo No. 9, Earthen Canal plug on Union Canal

Photo No. 10, Earthen Canal plug on Union Canal

APPENDIX B
(Three Year Budget Projection)

OAKS-AVERY HYDROLOGIC RESTORATION/ TV13a / PPL 6

Three-Year Operations & Maintenance Budgets 07/01/2020 - 06/30/2023

Project Manager	O & M Manager	Federal Sponsor	Prepared By
Dion Broussard, P.E.	*Dion Broussard, P.E.*	*NRCS*	*Dion Broussard,P.E.*

	2020/2021 (-18)	2021/2022 (-19)	2022/2023 (-20)
Maintenance Inspection	$ 1,000.00	$ 1,000.00	$ 1,000.00
Structure Operation		$ -	$ -
Administration	$20,000.00	$ 20,000.00	$ 20,000.00
Maintenance/Rehabilitation			

2020/2021 Description: Engineer and Design of low sill rock weir to replace Cow Path structure

E&D	$70,000.00
Construction	$0.00
Construction Oversight	$0
Sub Total - Maint. And Rehab.	$ 70,000.00
Sub Total Plus 15% Contingency	$ 80,500.00

2021/2022 Description: Begin removal and replacement of Cow Path structure

E&D	$ -
Construction	$ 90,000.00
Construction Oversight	$ 10,000.00
Sub Total - Maint. And Rehab.	$ 100,000.00
Sub Total Plus 15% Contingency	$ 115,000.00

2022/2023 Description: Complete construction of Cow Path low sill rock weir

E&D	$ -
Construction	$ 90,000.00
Construction Oversight	$ 10,000.00
Sub Total - Maint. And Rehab.	$ 100,000.00
Sub Total Plus 15% Contingency	$ 115,000.00

	2020/2021 (-18)	2021/2022 (-19)	2022/2023 (-20)
Total O&M Budgets	**$ 101,500.00**	**$ 136,000.00**	**$ 136,000.00**

O &M Budget (3 yr Total)	**$ 373,500.00**
Unexpended O & M Budget	**$ 373,500.00**
Remaining O & M Budget (Projected)	**$ -**

APPENDIX C
(Field Inspection Notes)

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-13a Oaks/Avery Canal Hydrologic Restoration

Date of Inspections: September 11 & October 14, 2020

Structure No. N/A

Inspector(s): Dion Broussard, Stan Aucoin, Maggie Luent, Mel Guidry (CPRA)

Structure Description: Earthen canal plug (Union Canal)

Water Level

Type of Inspection: Annual

Weater Conditions: sunny and warm

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	N/A				
Stop Logs	N/A				
Hardware	N/A				
Timber Piles	N/A				
Timber Wales	N/A				
Galv. Pile Caps	N/A				
Vegetation	Good			9-10	Vegetation Flourishing.
Signage /Supports	N/A				
Rip Rap/dike	N/A				
Eathern Embankment	Good			9-10	The earthen canal plug had experienced settlement intially, but is in good condition and does not require maintenance at this time.

What are the conditions of the existing levees?

Are there any noticable breaches?

Settlement of rock plugs and rock weirs?

Position of stoplogs at the time of the inspection?

Are there any signs of vandalism?

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-13a Oaks/Avery Canal Hydrologic Restoration

Date of Inspections: September 11 & October 14, 2020

Structure No. N/A

Inspector(s): Dion Broussard, Stan Aucoin, Maggie Luent, Mel Guidry (CPRA)

Structure Description: Spoilbank Maintenance (Oaks Canal)

Water Level

Type of Inspection: Annual

Weater Conditions: sunny and warm

Item	Condition	Physical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	N/A				
Stop Logs	N/A				
Hardware	N/A				
Timber Piles	N/A				
Timber Wales	N/A				
Galv. Pile Caps	N/A				
Vegetation	Good			8	Vegetation Flourishing.
Signage /Supports	N/A				
Rip Rap (fill)	N/A				
Earthen Embankment	Good			8	Spoilbank looks good. Plug is still holding up.

What are the conditions of the existing levees?
Are there any noticeable breaches?
Settlement of rock plugs and rock weirs?
Position of stoplogs at the time of the inspection?
Are there any signs of vandalism?

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-13a Oaks/Avery Canal Hydrologic Restoration

Date of Inspections: September 11 & October 14, 2020

Structure No. N/A

Inspector(s): Dion Broussard, Stan Aucoin, Maggie Luent, Mel Guidry (CPRA)

Structure Description: Shoreline vegetation

Water Level

Type of Inspection: Annual

Weater Conditions: sunny and warm

Item	Condition	Physical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	N/A				
Stop Logs	N/A				
Hardware	N/A				
Timber Piles	N/A				
Timber Wales	N/A				
Galv. Pile Caps	N/A				
Vegetation	N/A				Not inspected.
Signage /Supports	N/A				
Rip Rap (fill)	N/A				
Earthen Embankment	N/A				

What are the conditions of the existing levees?
Are there any noticeable breaches?
Settlement of rock plugs and rock weirs?
Position of stoplogs at the time of the inspection?
Are there any signs of vandalism?

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-13a Oaks/Avery Canal Hydrologic Restoration

Date of Inspections: September 11 & October 14, 2020

Structure No. N/A

Inspector(s): Dion Broussard, Stan Aucoin, Maggie Luent, Mel Guidry (CPRA)

Structure Description: Rock dike along southern bank of GIWW

Water Level

Type of Inspection: Annual

Weater Conditions: sunny and warm

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	N/A				
Stop Logs	N/A				
Hardware	N/A				
Timber Piles	N/A				
Timber Wales	N/A				
Galv. Pile Caps	N/A				
Vegetation	N/A				
Signage /Supports	N/A				
Rip Rap (fill)	Excellent			7	Rock dike is in good condition.
Eathern Embankment	N/A				

What are the conditions of the existing levees?
Are there any noticable breaches?
Settlement of rock plugs and rock weirs?
Position of stoplogs at the time of the inspection?
Are there any signs of vandalism?

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-13a Oaks/Avery Canal Hydrologic Restoration

Date of Inspections: September 11 & October 14, 2020

Structure No. N/A

Inspector(s): Dion Broussard, Stan Aucoin, Maggie Luent, Mel Guidry (CPRA)

Structure Description: Rock plug

Water Level

Type of Inspection: Annual

Weater Conditions: sunny and warm

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	N/A				
Stop Logs	N/A				
Hardware	N/A				
Timber Piles	N/A				
Timber Wales	N/A				
Galv. Pile Caps	N/A				
Vegetation	N/A				
Signage /Supports	N/A				
Rip Rap (fill)	Poor			6	Not inspected on this trip. No access to rock plug. No longer a necessary project feature.
Eathern Embankment	N/A				

What are the conditions of the existing levees?
Are there any noticable breaches?
Settlement of rock plugs and rock weirs?
Position of stoplogs at the time of the inspection?
Are there any signs of vandalism?

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-13a Oaks/Avery Canal Hydrologic Restoration

Date of Inspections: September 11 & October 14, 2020

Structure No. N/A

Inspector(s): Dion Broussard, Stan Aucoin, Maggie Luent, Mel Guidry (CPRA)

Structure Description: Spoilbank Maintenance Union Canal

Water Level

Type of Inspection: Annual

Weater Conditions: sunny and warm

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	N/A				
Stop Logs	N/A				
Hardware	N/A				
Timber Piles	N/A				
Timber Wales	N/A				
Galv. Pile Caps	N/A				
Vegetation	N/A				
Signage /Supports	N/A				
Rip Rap (fill)	N/A				
Eathern Embankment	Excellent				Spoilbank looks great. Difficult to differentiate repaired section from established sections.

What are the conditions of the existing levees?
Are there any noticable breaches?
Settlement of rock plugs and rock weirs?
Position of stoplogs at the time of the inspection?
Are there any signs of vandalism?

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-13a Oaks/Avery Canal Hydrologic Restoration

Date of Inspections: September 11 & October 14, 2020

Structure No. Cowpath Structure

Inspector(s): Dion Broussard, Stan Aucoin, Maggie Luent, Mel Guidry (CPRA)

Structure Description: Fixed crest weir

Water Level

Type of Inspection: Annual

Weater Conditions: sunny and warm

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
				5	West side of structure still seems to be attached to rest of structure, but no longer embedded. Could not be
Steel Bulkhead / Caps	Failed				seen due to high water level.
Steel Grating	N/A				
Stop Logs	N/A				
Hardware	Failed				
Timber Piles	N/A				
Timber Wales	N/A				
Galv. Pile Caps	Failed				
Vegetation	N/A				
Signage /Supports	OK				
Rip Rap (fill)	N/A				
Eathern Embankment	Good				

What are the conditions of the existing levees?
Are there any noticable breaches?
Settlement of rock plugs and rock weirs?
Position of stoplogs at the time of the inspection?
Are there any signs of vandalism?

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name: TV-13a Oaks/Avery Canal Hydrologic Restoration

Date of Inspections: September 11 & October 14, 2020

Structure No. N/A

Inspector(s): Dion Broussard, Stan Aucoin, Maggie Luent, Mel Guidry (CPRA)

Structure Description: rock paving at Oaks Canal

Water Level

Type of Inspection: Annual

Weater Conditions: sunny and warm

Item	Condition	Pysical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps	N/A				
Steel Grating	N/A				
Stop Logs	N/A				
Hardware	N/A				
Timber Piles	N/A				
Timber Wales	N/A				
Galv. Pile Caps	N/A				
Vegetation	N/A				
Signage /Supports	N/A				
Rip Rap (fill)	Excellent			2-4	Rock in excellent condition.
Eathern Embankment	N/A				

What are the conditions of the existing levees?

Are there any noticable breaches?

Settlement of rock plugs and rock weirs?

Position of stoplogs at the time of the inspection?

Are there any signs of vandalism?